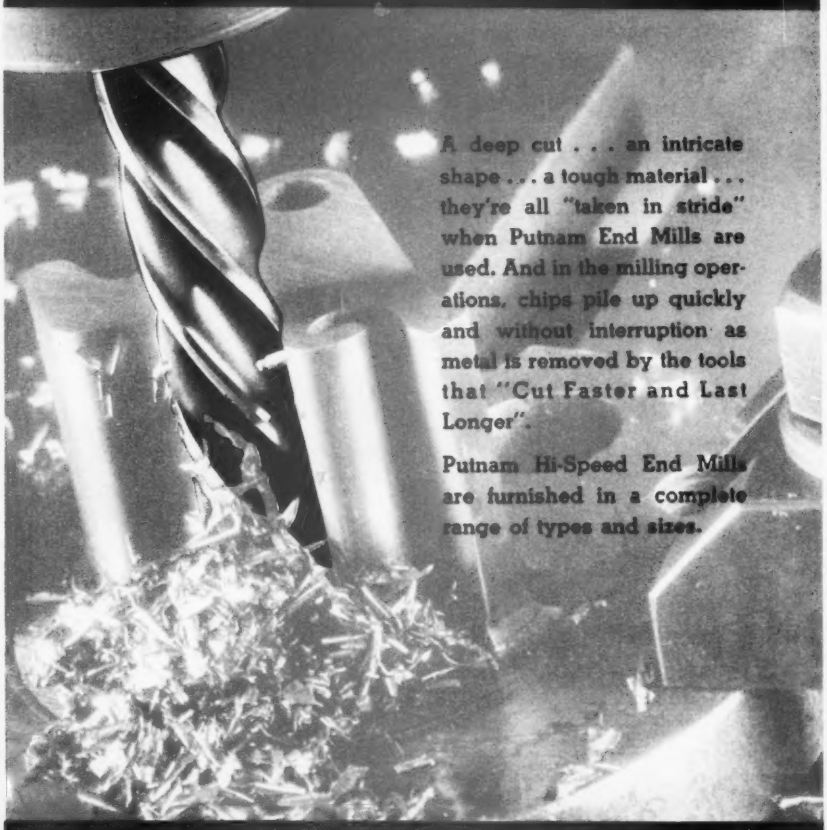
The TOOL & DIE Journal
Tool-Die-Machine PROGRESS

Unusually Difficult Jobs Emphasize The Quality of Putnam End Mills



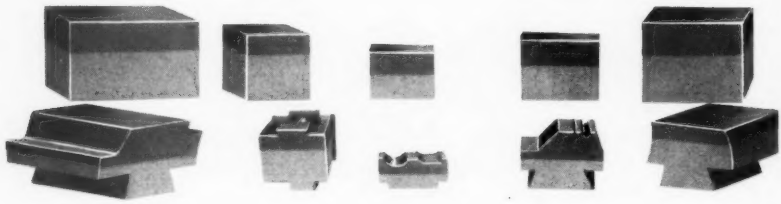
A deep cut . . . an intricate shape . . . a tough material . . . they're all "taken in stride" when Putnam End Mills are used. And in the milling operations, chips pile up quickly and without interruption as metal is removed by the tools that "Cut Faster and Last Longer".

Putnam Hi-Speed End Mills are furnished in a complete range of types and sizes.

PUTNAM *Hi-Speed* END MILLS

PUTNAM TOOL CO. • 2985 Charlevoix Ave. • Detroit

STRETCH HIGH SPEED STEEL THIS NEW WAY



Dovetail forming cutters made from FCC Electrically Welded Composite Steel Blanks *(high speed steel cutting face; mild steel base)* save at least 50% of high speed steel. Besides, they offer other distinct advantages. Obvious among them are:—

1. Non-hardenable, tough base minimizes tendency to crack and break out at sharp dovetail corners and screw holes during heat treating or when working.

2. Easier to drill and tap screw holes and machine dovetails in mild steel base; this work may be done *after* hardening if desired.

3. More prompt delivery because of reduced amount of high speed steel.

4. Inseparable bond between cutting face and base assured by special technique of electric welding.

5. *Marked saving of strategically important tungsten.*

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QUALITY FCC SERVICE

THE FORGING and CASTING CORPORATION

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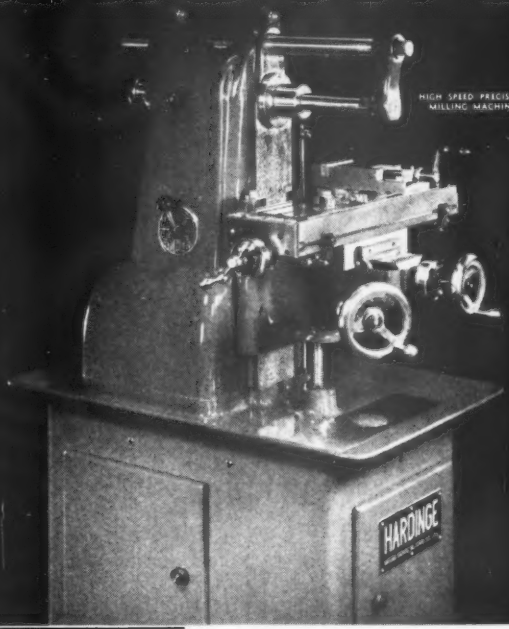
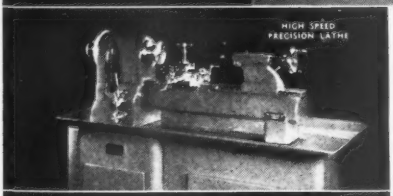
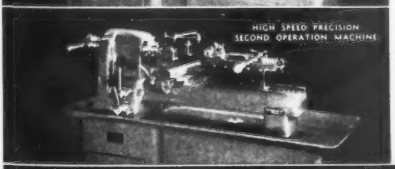
HARDINGE







UNUSUAL CAPACITY

(No. 3 OF A SERIES)

Hardinge pioneered the feature of having ample collet capacity. While always desirable, this feature is of particular value today. With it is combined the Hardinge preloaded ball bearing spindle construction, providing a range of spindle speeds for the proper machining of bar material, varying from 1/32" to 1" diameter or chucked work to 5" diameter.

The Hardinge 1" collet capacity is not through the use of a sleeve or other arrangement, but is direct in the spindle to provide the greatest degree of accuracy.

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"Specify Hardinge and you are assured of engineered efficiency."

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ELMIRA, N. Y.

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The TOOL & DIE Journal

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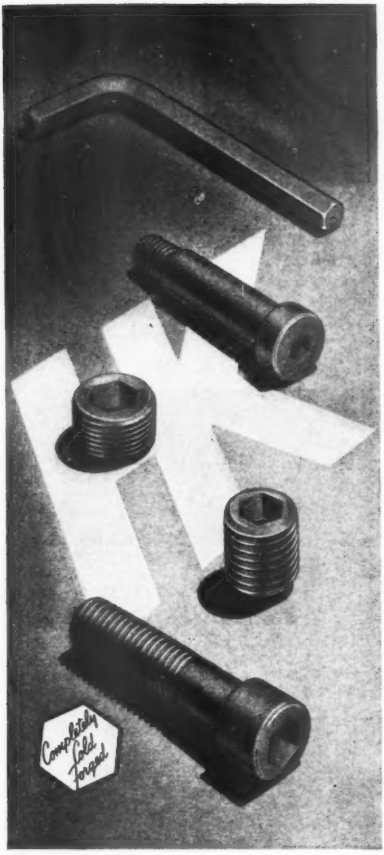

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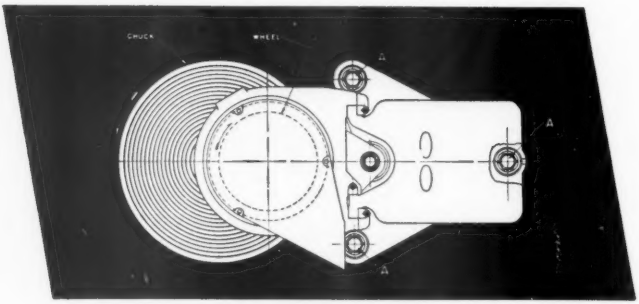

Work carried on the Blanchard rotary magnetic chuck is ground with the end of a cylinder or segment wheel. A flat surface is generated on the work regardless of the shape of the wheel face. The two sets of curved grinding marks, crossing each other all over the surface, serve as a check on the flatness. There can be no low or high spots in such a surface. One test with a straightedge across the center will check the alignment of the machine. This correct parallel alignment of the axes of wheel and work is easily maintained with the Blanchard Three Point Column Support, indicated at "A" in the drawing above. This means of adjusting spindle alignment has been proved dependable and convenient by thirty years of use.

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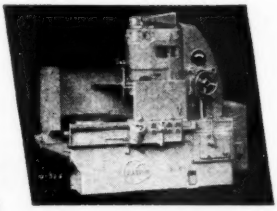

No. 18 Blanchard Surface Grinder

How to Slice a Meteorite!

Ever see a shooting star? There are about 7,500,000 every night! Most of them burn up in the outer atmosphere, and the few that reach the earth are man's only material link with celestial space. For examination and study, these hard, dense meteorites are easily sliced with a special type of bandsaw using Carborundum Brand Abrasive Grain as cutting agent, then finished with finer grain and powders.

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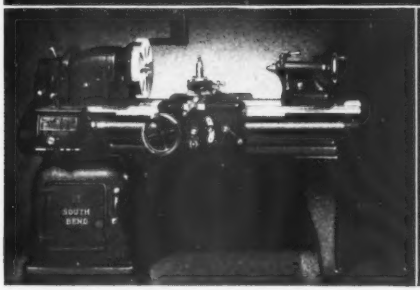
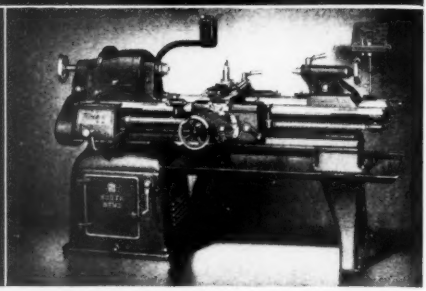
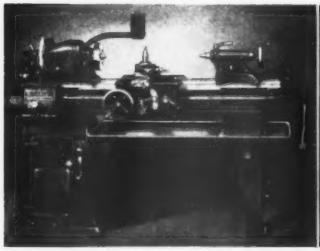


16" swing South Bend Underneath Motor Drive Quick Change Gear Precision Lathe.

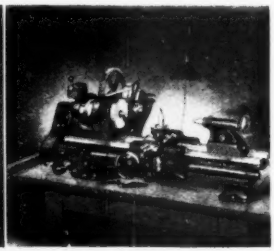


14½" swing South Bend Tool Room Underneath Motor Drive Precision Lathe.



13" swing South Bend Underneath Motor Drive Quick Change Gear Precision Lathe.

10" swing 1" Collet South Bend Tool Room Underneath Motor Drive Precision Lathe.



9" swing Model A South Bend Workshop Quick Change Gear Precision Bench Lathe.

THE importance of selecting the *Right* lathe for every shop need is emphasized today by the urgent demand for increased production resulting from our present national emergency. Maximum production at minimum cost can be attained only when the lathe is matched perfectly with the job.

Consider the work to be done, then choose the size and type of lathe that will give you the most efficient service. Remember that versatility and precision are important in a tool room lathe. For manufacturing operations, a lathe must also have plenty of power, speed, stamina.

South Bend Lathes are made in a variety of sizes and types that will efficiently handle a wide range of metal working requirements. They can be supplied with equipment for precision tool room work, manufacturing operations, general machine work, and for many special classes of service.

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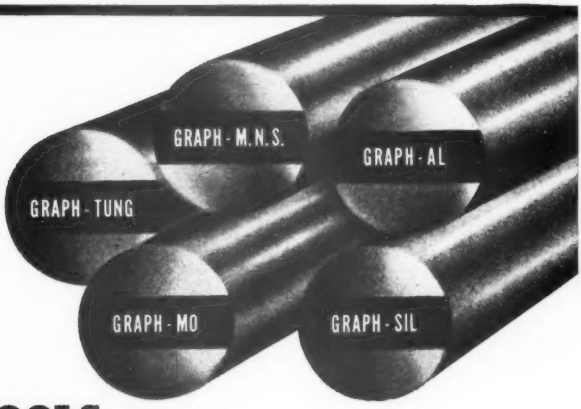

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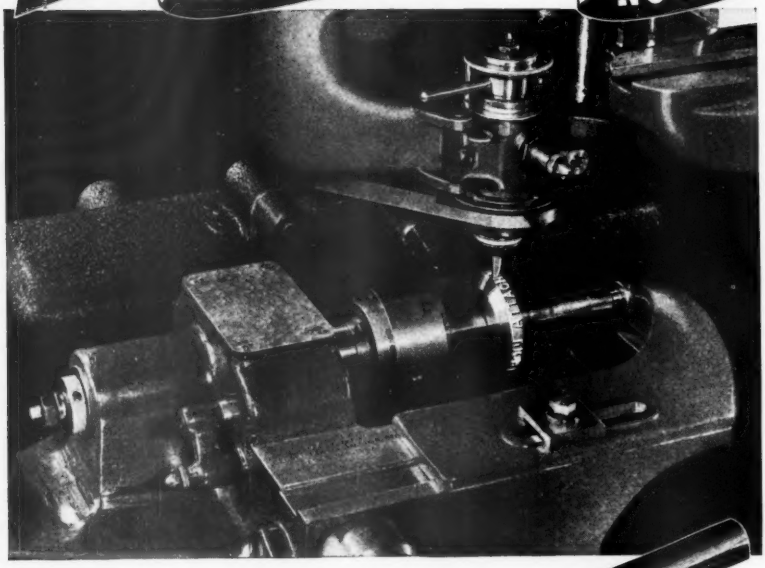

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XLO

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One in a series of messages showing how Atlas helps in the Defense Program

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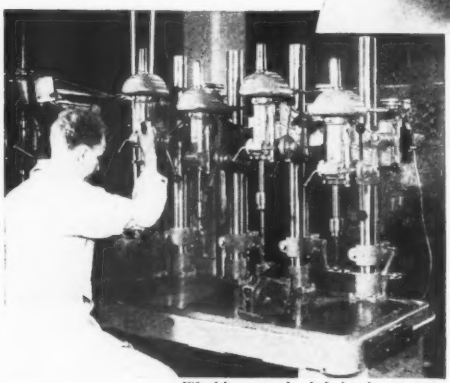
A new weapon for the battle of the production lines—used like other Rivett products for plane, tank, ship and gun building—is this fast new internal and external precision grinder. The "104" grinds holes up to 3" in diameter—dust off thousandths of inches at speeds up to 35,000 RPM. Manufactured by Rivett Lathe & Grinder, Inc., Boston.



Working on the lubrication pumping unit for the Rivett "104"

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SPEED UP PRODUCTION

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Our engineers are at your service for consultation on design problems.

THE BUNELL MACHINE & TOOL COMPANY

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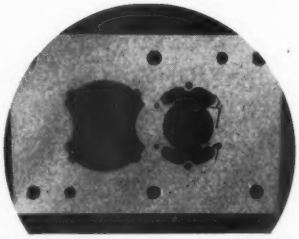
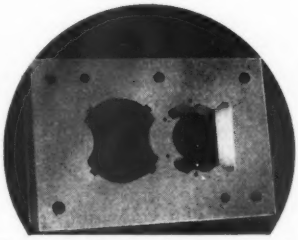
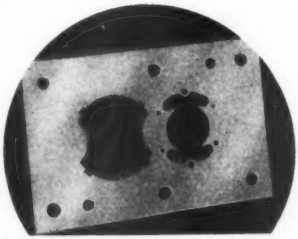
"WE COULD HAVE MADE A NEW DIE, BUT . . . . .



Broken!! And A New Die Would Involve Delay and Cost $350.



Damaged Section Removed and Die Prepared for Insert.



Fitted With Insert. Good As New and ready to Go Back In Production With A Minimum of Lost Time.

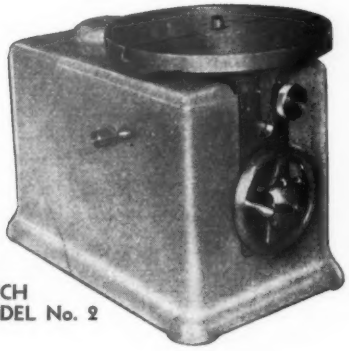
A new die would cost $350 and the cost in delayed production would be even more."

That is what confronted the Speedway Manufacturing Company of Chicago when a broken die tied up production.

Their problem was solved by grinding away the damaged section with a Boyar-Schultz Profile Grinder No. 1 and fitting in an insert. The larger part of a new die cost was saved, in addition to the very important saving in time.

Boyar-Schultz Profile Grinders are made for grinding and fitting irregular shapes and contours so often encountered in making dies and punches, and in grinding to scribed lines. Work that would ordinarily take hours is completed in minutes.

Learn About This Time Saving Tool. Write For Literature.



BENCH MODEL No. 2

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We have designed and built special gages of every type and description for a number of leading production manufacturers.

May we quote on your gage and gaging fixture requirements?

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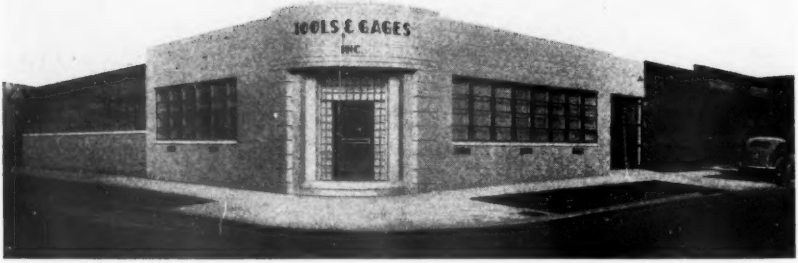
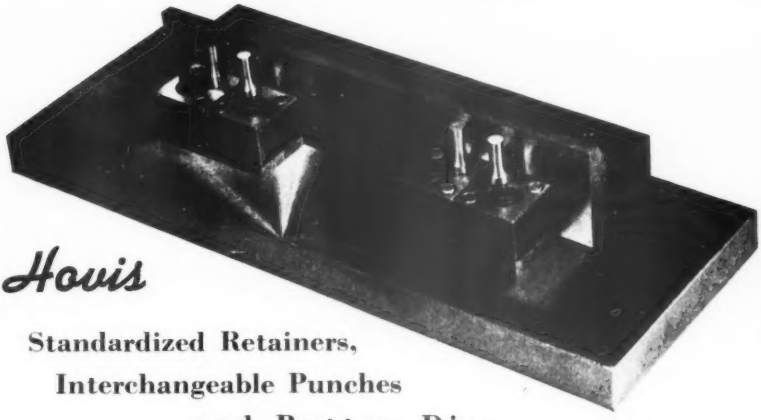


3112 E. 63rd St. **Cleveland, Ohio**



Hovis

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1. Compound Dies with punches mounted close to the die sections make the use of this design advantageous because they require less space than long, narrow end type retainers.

2. A series of square hardened steel retainers made especially for high production and progressive dies. We also make a series of round inexpensive retainers for "Budget" Dies. Punches fit either series.

3. Close grouping of standard retainers is possible because they are made with the punch close to one corner, which has all the advantages of both the square and end type retainers.

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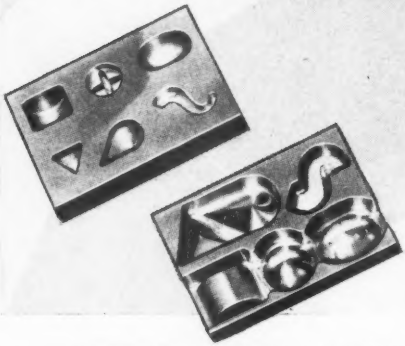


. . . A TYPICAL EXAMPLE OF THE VERSATILITY AND SPEED OF THE MILWAUKEE ROTARY HEAD TOOL AND DIE MILLING MACHINE

The steel block, shown above, with its variety of geometric forms, was milled completely on both sides, without models or templates, in one setup on the Milwaukee Model D Rotary Head Tool and Die Milling Machine.

At no time during the entire milling process was either block moved from its original position in the milling machine vise.

This is another example of speed and versatility of a Milwaukee Model D—the machine that transmits blueprint into steel in a single setup—layout, milling, drilling, precision boring and slotting operations.

Investigate this machine and the new technique it offers for the production of dies and tools—in far less time, with positive accuracy, and at very low cost.

KEARNEY & TRECKER CORPORATION
MILWAUKEE WISCONSIN, U. S. A.

Milwaukee MODEL D ROTARY HEAD TOOL AND DIE MILLING MACHINE

KEARNEY & TRECKER

Milwaukee MILLING MACHINES

The TOOL & DIE Journal

NOVEMBER, 1941 Vol. 7, No. 8

The Design and Layout of Progressive Dies

Part I

By Ernest Mehwald
Atlantic Tool & Die Co., Inc.

This is the first of a three part article by a practical shop man whose work is largely with progressive dies—particularly intricate many station dies. Layout, pilots and side cutters are covered in this installment.—The Editor.

THE Progressive Die is a widely used type of die construction. Its principle is to start and complete a number of single operations in one die. These may be piercing—cutting—forming—embossing—blanking, etc. Progressive dies can incorporate simple or complicated operations. They may be applied to parts with commercial or precision limits. They are especially economical on very small parts which would otherwise entail an additional, extremely difficult handling.

Progressive dies cover a very wide field. It is, therefore, practically impossible to bring the construction of such dies under rigid, inflexible rules. One type of die arrangement excellent for one part and material may not work out as well when applied to other or different parts and materials.

Design and Layout

Progressive die constructions are flexible. The construction of each die requires an application of principles, rather than rules. The experience of both designer and die maker will be drawn upon. A number of seemingly less important details such as provisions for quick economical punch and die replacement; for stripping and free feeding; for spring plungers and gaging and for unloading finished parts may finally decide whether a job is satisfactory or not. *The mastering of these small details is the secret of success for progressive die designing.*

There are, however, fundamentals on which all progressive dies are based. It is vitally important to *have all stations in accurate relation to the final part.*

Layout of Progressive Dies

Progressive dies require an exact layout. Mistakes may become costly. They may not be noticed until the die is in the press for tryout. Constant checking and rechecking is necessary. The designer can help by simplifying the reading and understanding of the print.

Part shapes should be distinctly outlined. Figures should be given clearly. Vitally important working dimensions must not mingle with less important details like locations of screws, dowels,

springholes, etc. Prints of progressive dies, with many stations especially, can make a confusing blur of figures if not arranged precisely.

It is helpful to the die maker if a separate layout of the die face is furnished in addition to the necessary construction views. Working lines and dimensions should be specified as the die maker needs them to proceed efficiently. It should not be necessary for him to have to figure the job all over again. The designer's drawing should permit him to visualize his procedure. It is helpful to establish the centerline of the part on each station: horizontal, vertical and, if necessary, angular. The relation of dimensions to each other should be clearly shown. Important angles can be more accurately produced and checked if given in figures. Therefore, these dimensions should be established wherever practical.

The skill of a die maker is required to produce a clear and correct layout on the die face. Good work can be achieved best with good tools. Height gage, surface and angle plates, parallels, scribers, dividers, etc., must be in first class condition. On close layout work die sides and ends should be ground square; it eases rescribing and checking. It is also practical to have bridge, or solid strippers ground together with the die to the same size. Both can then be laid out in one setting. It is good practice to locate centerline of part and strip in exact center of die whenever possible. Establishing gage locations and checking working contours will thereby be simplified.

Practical Method to Determine Centerline

An accurate centerline can be quickly and easily determined by turning the die over and checking a first height gage setting. The difference in the two lines scribed is double the distance from the centerline. Continue to adjust the height gage settings until the lines coincide, using either side of die in turn as a base. On sectional dies draw certerline and lines of the stock width horizontally over all sections. This gives a clear idea as to the best locations for other construction necessities such as screw and dowel holes, etc. Drawing these lines to the very edge of each block helps in matching sections and assembling the job after hardening. The top of the die should not be ground until all sections are checked and dowelled in position.

In laying out round holes and corners with height gage, it is good practice to locate, in addition to the centers, the outside size in squares around them. This is especially true for accurate tracing of holes and bushings which will be drilled and reamed.

The decrease in the visibility of layout lines is a constantly recurring difficulty. Depending on size and accuracy, jobs often take a relatively long time to work out the layout contours and details. Blue vitriol, or other chemicals used, does not prevent the lines from becoming less sharp as the job progresses. Burrs produced in necessary machining operations, such as drilling, milling, filing, etc., further help to blur out layout lines. A good method of keeping the lines sharp in spite of these conditions is to warm all layout faces slowly over the top of the furnace or on a hot plate until dark brown or until a light blue color shows; then cool the die section in oil.

Layout men should always retain all height gage settings and records for back checking or to check back for speedy relayout until the job is finished and accepted.

Having established an accurate relationship between all single stations, the next equally important principle on any type of progressive die is to *keep these spacings exact* while the strip travels. The design must insure a correct amount of movement and stop of material. The feed must be right. This can become a serious problem on more complicated jobs. Travel of material is controlled either manually or by machine feed. There are important construction differences in designing a hand or automatically fed progressive die.

Hand Feed—Pilots

The simplest progressive die is the straight cutting job—pierce, notch, cutoff or blanking. Even on these types maintaining an exact relation to final station by hand feed of strip is difficult without additional locating devices. A positive final stop is usually sufficient on two station dies producing parts with commercial tolerances from coil stock. With more stations finger stops will have to be added. If more accuracy is required, pilots must be incorporated. It is best to have pilot holes pierced in the first

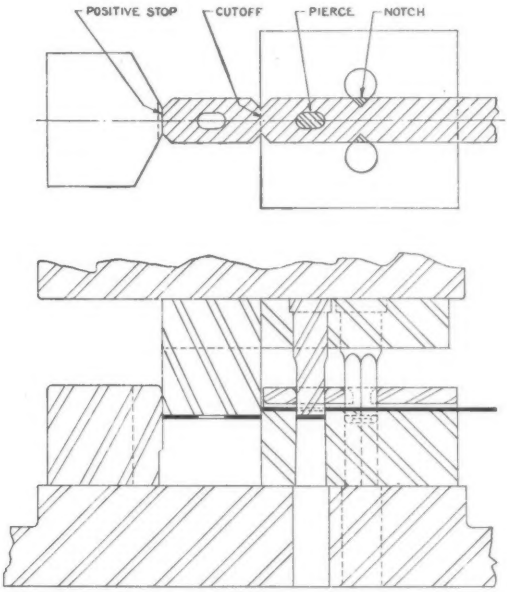
station and start actual locating in the following station.

Some holes on parts which require pierced holes may be used for piloting. However, they should be of sufficient diameter. They should not be less than $\frac{1}{32}$" in diameter on stock thickness of .020" or less. They should be larger on heavier material. Pilots are commonly located in the punch holder. Pilots must be rigid. As a rule they should be spaced as far apart as possible across the strip. In many cases they can be located in the strip skeleton. To prevent bulging out, they must not be too close to the outside edges of the strip. Pilot holes in the die should also be transferred through the die to prevent clogging by mishits.

Clearance between pilots and pilot holes in the die, and between pilots and pierce holes in the strip should be just enough to allow free entering — about .001" to .002". Two pilots in perfect alignment are usually sufficient for a straight cutting job. In a more complicated die with many stations more pilots should be added. As a practical rule figure one set of pilots to each three stations.

For a final, efficient check provide pilots in the last station punch whenever possible. It has been found practical to use straight, up-to-size pilots and have a tapped hole go clear through the shoe. Set screws when used for backing up pilots allow a fast removal or lowering of pilots below the punch surface when grinding or sharpening of punch is necessary.

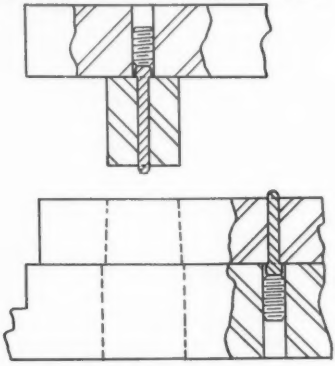
The arrangement of pilots in the upper punch holder decreases in efficiency when stock thickness is relatively thin, say below .015", or when only small pilot diameter is possible; also when high precision is required and when the amount of stock to be pierced or notched out is greater than the remaining material for the finished part. The strip skeleton then loses its rigidity and has a tendency to distort. Pilots entering from above do



Plan and section through centerline of a simple progressive notch, pierce and cutoff die. The pilot hole is pierced in the first station and locating against a positive stop is begun in the second station.

not locate accurately in thin stock but usually push the pilot hole in the strip out of shape.

A more satisfactory construction for thin stock is to anchor the pilot in the lower die. Apply the same construction principles as for final station punch pilots; i.e., back-up screws for easy removal of pilots, etc. In this type of pilot arrangement it is better to use a spring stripper instead of the commonly used bridge or channel stripper, since the spring stripper holds the stock flat while



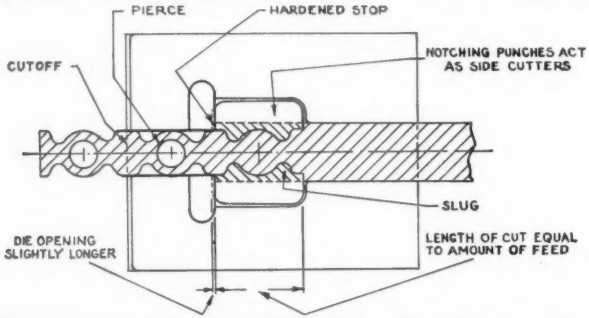
Stock thickness, accuracy in location and desirable operating speed determine whether pilots are to be placed in the upper punch holder or in the die. Pilots entering thin strip (under .015") from below are preferable.

cutting operations are in progress and allows an easier lifting of the stock above pilots, and feeding of the strip. A die with this pilot arrangement is somewhat slower to operate than the reverse pilot arrangement but it is more accurate.

Side Cutters

Many stampings produced by progressive dies do not permit the incorporation of pilots—especially on small work. Accurate hand feed in this case may be achieved by the construction of side cutters. Sometimes notchings in the part may be used as side cutters.

Certain points are fundamental when a progressive die is equipped with side cutters. At least one side cutter must always be the first or starting station to assure that the travel starts correctly. They also must cut the right length of material. This is often easily overlooked. A punch one inch in length, for instance, does not necessarily cut exactly a 1" long notch and permit 1" travel of strip.



Notching punches used as side cutters. Variations in strip movement caused by stock thickness and hardness can be corrected in dies of relatively few stations by working the die opening slightly longer toward the stop edge. Adjustments can be made on the stop.

Depending on the type of material, stock thickness and hardness, the cutting edge might show a more or less smooth, rough, broken or even tapered face. These conditions may cause a

variation in the desired amount of strip movement. While this variation usually does not seriously affect progressive dies with only a few stations it may accumulate to a sizable amount on longer dies with a larger number of stations; it may even dislocate operations.

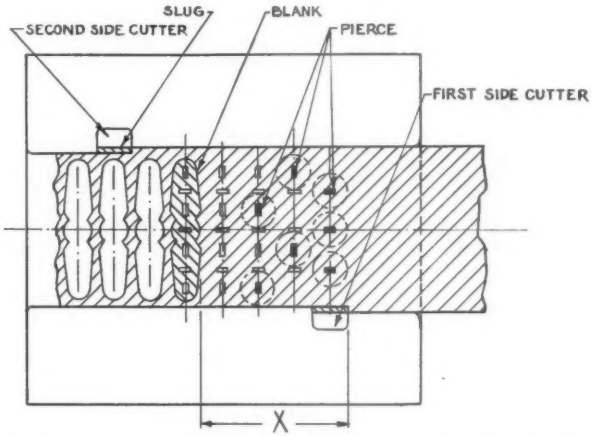
A practical way to correct such a variation is to keep the cutting punch to size but to work the die opening slightly longer toward the stop edge. Adjustments then can be made on the stop.

Such a longer die opening also prevents the slight markings which show where the cut ends and the new cut begins. Once the die opening is short, or the travel has to be increased, these markings may take the shape of fins or protruding corners. It makes further free feeding difficult and inaccurate.

Stop edges should be hardened and sufficiently anchored. Care must be taken to have the correct width of the narrower stripper or gage channel. It should permit free feeding but not allow undue side "shake" (about .005" clearance between cut strip and stripper gage is practical). Side cutters must be absolutely parallel with the gage. Strip width should allow at least $\frac{1}{16}$" depth of cut on each side to permit a positive stop.

Having two side cutters as first station of the die gives an excellent job and a clean, accurate cut which permits very satisfactory gaging. However, it also results in a waste of material. Being the first, or farthest from the final station, there is no fixed stop once the side cutting operations have reached and passed the end of the strip. The material pulls through without having completed the necessary operations to the final part. In such a case, the material from the final station to the first side cutting station is wasted.

To remedy this, side cutters may be arranged accordingly. One side cutter must be the first station. The other one may be placed closer to the final station, or even past it. By this type of construction only one side cutter takes care of the strip movement until the strip reaches the second side cutter, then both will work. As the strip end passes into the die only the second side cutter will be in operation. However, the strip, still being held by the second side cutter, will be entirely used up.



Strip skeleton showing two side cutters — the first in the first station, the second past the final station. The second cutter in this position allows the strip X, otherwise waste at end of strip, to be entirely used up.

Progressive dies with side cutters allow very fast feeding. As a rule they work best with half-hard or hard material of medium thickness. Too thin or heavy, or soft materials are usually not as satisfactory.

A Reader Requested Article

Grinding Equipment for the Tool Room and Die Shop

The Black & Decker No. 7 Die Grinder cleans and sharpens die faces quickly and economically.

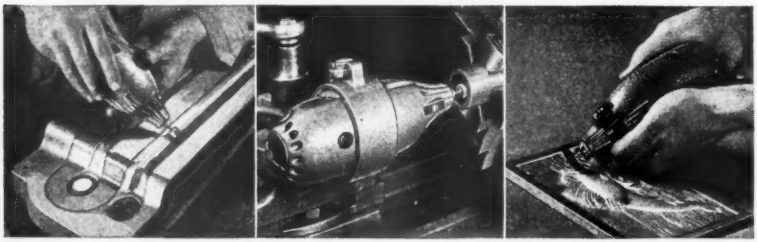
PERHAPS no class of grinding equipment in the modern tool room and die shop is called upon to do such a wide variety of jobs as is the hand grinder. The hand grinder may either have air or an electric motor as a source of power. In this article the advantages and use of the motor driven hand grinder will be reviewed.

In spite of the changes in the types of work being done in tool rooms and die shops at present—in some cases very different from even a few months ago—any essential characteristic of the precision work being done remains unchanged. To do precision work a hand grinder must be precision built. Motor parts, including armatures, must be perfectly balanced to eliminate vibration. Special ball bearings must be selected to keep the drive shaft running true at speeds from 15,000 to 25,000 rpm or more. Other motor parts, including the fan for keeping the tool cool, must stand up for intermittent or hard continuous service.

The Skilsaw Hand Grinder is shown grinding off clearance on a punch. Note how the unit is held in one hand.

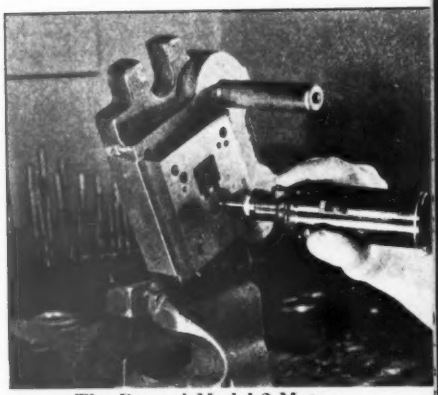
The second requirement for hand grinders is that they be convenient to use. Some grinders require both hands of an operator but more require only one hand. This means that either the housing of the grinder itself or the handle—if a handle is provided—must be designed to be held securely in one hand. This means a hand grinder must be both compact and light in weight. A number of hand

Left — The "feel" of the Duro Streamline Grinder makes touching up easy. Center—A tool post adaptor quickly makes external or internal grinding practical. Right—Delicate cleaning or polishing requires vibrationless performance.



Part Three of a Series

MOTOR DRIVEN HAND GRINDERS



The Dremel Model 2 Moto-Tool is shown grinding an intricate die opening.

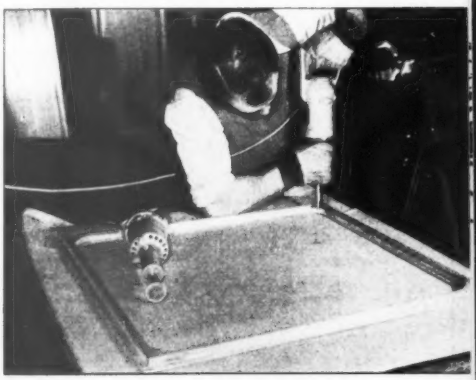
grinders made by leading manufacturers are either shaped to fit the hand of the average operator or designed so that the housing can be held in the hand for indefinite periods without undue fatigue. Most hand grinders are so light—from 9 or 10 ounces to 3 pounds—that tool and die makers can retain the "feel" of close precision work—a valuable advantage in retouching and finishing work. The compactness and light weight often allows the operator to work on surfaces that would be difficult to reach or to work in by any other method.

The third requirement of hand grinders for precision work is that they possess sufficient power under load to do the job. Unless the grinder is properly powered, the full load speed may drop so far below the idling or no load speed that the abrasive cannot do its job efficiently. High speeds are essential to develop power to do efficient work in a hand grinder since the mounted points, wheels or discs are small in diameter and require high rotative speeds to achieve efficient peripheral or surface speeds. All abrasives used for grinding wheels do the work for which they are intended at speeds rated in surface feet per minute. For this reason it is important that properly mounted points, wheels or discs be selected in each case.

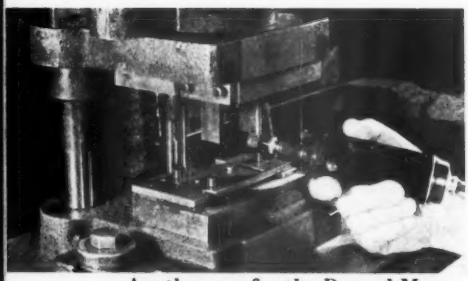
The Dumore No. 10 Hand Grinder is excellent for refinishing small die cavities.

Obviously the design of hand grinders must be balanced—with precision construction, light weight, compactness, power and speed all provided to do a great variety of grinding jobs at the most efficient cutting capacity of a given abrasive.

There are literally hundreds of uses for a motor driven hand grinder in any

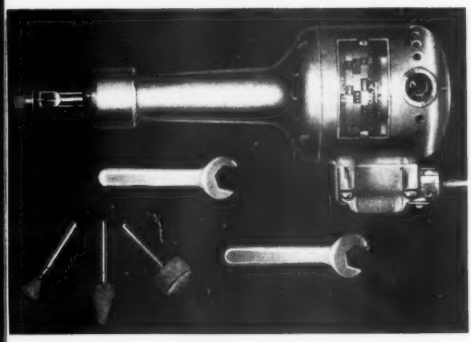


Two Dumore No. 9 Hand Grinders are used to eliminate the necessity of changing wheels when grinding radii of different sizes. The job is grinding welds on aluminum window frames.



Another use for the Dremel Moto-Tool is to grind cutting edges of punches in position.

tool room or die shop. A few of the most common uses are trueing up tools or die part distortions after heat treating; retouching, polishing and finishing forming dies on all radii; grinding oil



An exclusive feature of this Clark No. 0 Die Grinder is the replaceable time lag fuses mounted on the housing.

grooves in hardened bushings; key seating and slotting hard stock; grinding drills and touching up taps and reamers; and countersinking holes in hard stock.

Resharpening angular cutting edges with the Black & Decker No. 7 Die Grinder.

Of course, there are also many applications outside of precision work. Marking tool or part numbers of hardened steel, grinding out crystallized spots, testing steel by spark method, rough grinding and cleaning, removing corrosion, sanding and many other jobs can be done quickly and efficiently.

Dumore Builds Full Line

The Dumore Company makes a full line of die grinders. The No. 9 and No. 10 Hand Grinders may be taken as representative types. The No. 9 Hand Grinder is a husky handle type tool, weighing 7½ pounds and equipped with a ¼ hp universal motor that drives the spindle at a maximum speed of 16,000 rpm. The armature is dynamically balanced, with windings pre-expanded and sealed to prevent centrifugal "breathing"—the armature shaft is mounted on shielded ball bearings. A built-in air filter seals out dust and grinding particles. Cool running in continuous service is assured by forced ventilation. The No. 9 is a popular tool because it is powerful enough to handle tough jobs yet small enough to get into tight corners and narrow apertures. It is particularly valuable in grinding or polishing large and irregular work.

The Dumore No. 10 Hand Grinder is a smaller tool (weight 2 pounds, 12 ounces, 1/10 hp motor), yet it is built with the same precision as the No. 0. Developing 22,000 rpm (idling speed), the No. 10, with 3 selected precision ball bearings, grease sealed, is equipped with a ⅛" collet chuck, a "snap on" filter cap and a toggle switch. It is an all round offhand grinder, its design and power permitting finishing of small openings, radii and irregular shapes in all types of molds and dies. One use is in tapping small holes.

The Black & Decker Mfg. Co. make a very complete line of portable electric tools, including their No. 7 and No. 12 Die Grinders. The No. 7, with an overall length of 9" (weight 2½ pounds), takes a maximum wheel size of 2" x ½" x ½". The No. 12, with an overall length of 14½" (weight 4 pounds) takes a maximum wheel size of 2½" x ½" x ½". Both grinders develop a spindle

(Continued on Page 60)

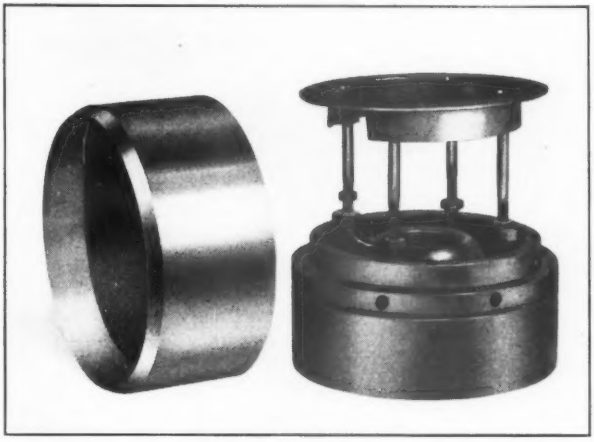
Tool Steel Tubing Proves Important in Saving Time and Metal

THE use of tool steel tubing for simple blanking and forming dies is another example of the many uses of such tubing. Since rings can be cut from the exact size of tubing required, there is no milling from solid bars, no extra machining or forging cost and no difficulty with annealing.

A large manufacturer of abrasive and polishing discs found that their cost of stamping out abrasive coated fibre combination discs .072" in diameter was high due to the fact that the severe abrasive action required frequent grinds or sharpenings. The problem was put up to The Bissett Steel Company who recommended that sections of their Nonshrink Oil Hardening Tool Steel Tubing be used. Sections of their 7" diameter tubing were cut to length and bevelled 30 degrees to a shearing edge, on a Heald Grinder. The dies were made up and furnished.

Five dies were mounted on a high speed single action press that operates at the rate of 10 strokes per minute. This gave a production rate of fifty discs per minute. A total of 128,000 discs were made before the cutting edges had to be reground—more than twice the previous production between grindings. This meant increased production, another important advantage, in addition to the lower initial cost of the dies. When the time saved in tool room time, as compared to the construction of a conventional blanking die was also estimated, the total cost of press operation per hour and the production cost per finished disc was very considerably lowered.

Tool steel tubing is manufactured by the extrusion process. By this method the molecules are pressed close together to form a sound, close-grained, homogeneous piece of steel.



Left—Punch made of a section of 7" tool steel tubing. Note the beveled cutting edge and the thickness of the tubing.
Right—Die showing the simplicity of the arrangement for leveling and the air spaces to free the blanked out discs.

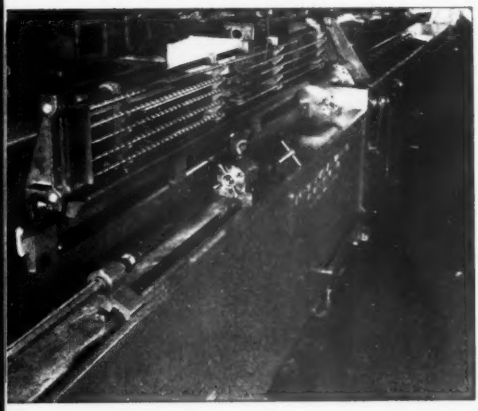
Another factor, very important at present, is that the use of tool steel tubing helps conserve costly tool steel. Tool steel tubing has a large number of successful applications in addition to blanking and forming dies and punches. It is used for collets and collet closers, spindle and lead screw thrust collars, ring gages, bushings, rim rolls, master tools, slitters, spacers, round cutting tooth and machine tool parts.

For additional information on tool steel tubing, write The Bissett Steel Company, 945 E. 67th St., Cleveland, Ohio.

Rifling of Cannon by Use of Spiral Broaching Tools

F. J. Lapointe

THE American-developed Hydraulic Push Broach Rifling Machine for rifling cannon up to 105 mm is designed to produce both constant and accelerated lead spirals with cutter tools that cut all grooves at one time. A series of cutters, each succeeding one of slightly greater diameter than the preceding one, are passed through the cannon barrel. The last full size cutters cut the full depth of the channels so that rifling is complete when they have finished their cut. The process results in quite a time saving over the older method where single rifling tools were used or where only a given number of the channels were broached at a time.



Rifling cannon by means of long spiral broaches is not new. To the writer's knowledge the first time this was done on long rifling sections was in the latter part of 1917, when two broaches were used on a Screw Type Broaching Machine on One-Pounder cannon with a bore of approximately $1\frac{7}{16}$" diameter to broach twelve spiral grooves.

American has developed a pull type Hydraulic Rifling Machine using a set of solid broaches for rifling barrels of several sizes. The new developments recently brought out by the American Broach & Machine Co. incorporate advanced engineering machine design. In February developments were made and tests carried on for broaching smaller cannon, particularly the 20 mm cannon.

(Continued on Page 34)

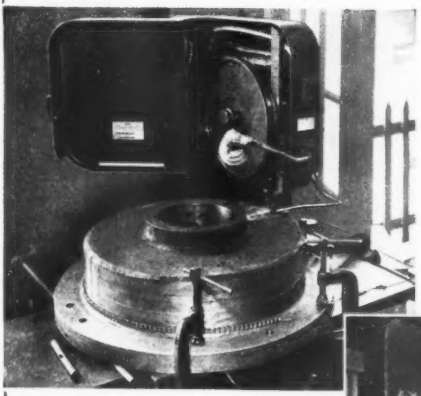
Above, the American Pull Broach Rifling Machine is set up ready to pull the first (bottom) broach. The four working and the short master sizing broach (top) travel in a carrier with the pull head. The muzzle end is placed in a bushing in the face plate, the breech end is locked and centered in the quick clamping rest. The oil tube is shown at lower left.

Right, the machine has completed the first cutting stroke. The first broach is then removed, the machine reversed and the second broach inserted in place.

DoAll CUTS WHOPPERS

LIKE THIS

1850 POUND DIE



No, it's not a big Wisconsin cheese, but a solid steel die (10" thick 33" diameter) weighing 500 pounds more than the DoAll Machine on which it was cut in the plant of the Midwest Pipe & Supply Co., St. Louis, Mo.

"GLASS BOOT" DIE PARTS

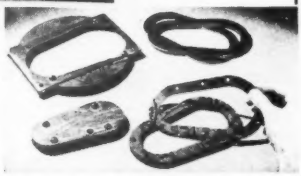
Here's an assembly die sawed and filed in 90 minutes at the Taylor Instrument plant, Rochester, N. Y. This die makes parts for the famous "glass boot" used in modern hospitals.

FASTEST METHOD OF REMOVING METAL

Makes no difference what it is—aluminum, brass, bronze, copper, iron, steel, nickel, zinc—any kind of metal, alloy or plastic—forgings, castings, tubing, blocks or sheets—the DoAll cuts it with savings of time and metal that are astonishing. Takes the place of shaper, milling and lathe work on hundreds of different jobs in large and small defense and industrial plants everywhere. In addition to internal and external sawing, the DoAll does band filing and polishing.

3-OUNCE GASKETS

Cutting gaskets — generally a pain in the neck — is easy with a DoAll. The



paper is screwed between two plates, the cut made through the plates, maintaining smooth gasket edges.

IT WILL PAY YOU to have one of our factory-trained men call at your plant to show you what a DoAll can save you.

FREE—Literature and 158-page Handbook on Contour Machining.

DO-ALL Contour Machine BAND SAWING BAND FILING BAND POLISHING

CONTINENTAL MACHINES, INC.

1303 S. Washington Ave. Minneapolis, Minn.

Associated with the DoAll Company, Des Plaines, Ill., Manufacturers of Band Saws and Band Files for DoAll Contour Machines.

Rifling of Cannon by Use of Spiral Broaching Tools

(Continued from Page 32)

The 20 mm cannon bore is approximately 70″ overall length, with a broached spline section of approximately 60″. The floor to floor time required for broaching this is approximately ten minutes, depending to a considerable extent on the skill of the operator.

The tools consist of a set of four broaches. The first broach cuts one-quarter of the width of the groove to be broached, broaching all the grooves at one time, cutting to practically the full diameter, minus a few tenths. The first broach, as well as the other broaches, has three oil channels its entire length. There are nine splines in these broaches; six of the spaces between the splines are used as body for guiding the broach within the bore. The other three spaces, i.e. every third space, has an oil channel ground in it between the cutting splines to serves as a passage for the oil so that a lubricating oil may be forced through this passage rapidly under pressure.

The second broach cuts the same amount of stock, but the width of the splines being twice as wide as the first broach allows the second broach to cut a ribbon off each side of the previously cut groove. The previously broached groove in the cannon serves as an added oil passage for the lubricating oil which is fed under pressure in the direction in which the broach travels.

The third broach cuts an additional one-quarter of the width, or three-quarters of the final width of the groove, and performs the same as the first and second broaches.

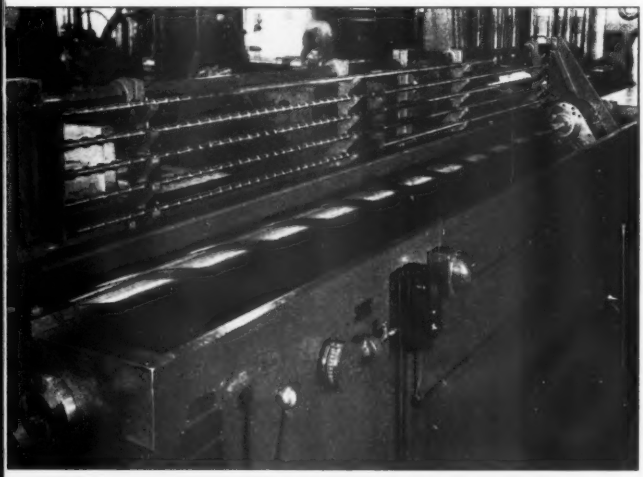
The fourth broach follows the same principle with the exception that at the finishing end several teeth are used for final sizing, finishing the splines to their full depth. A fifth master sizing broach is very short and is used only when the fourth broach shows signs of dullness.

The broaches used are approximately 48″ long and can be serviced by ordinary broach grinding equipment without resorting to special designed machinery for this purpose and can be ground by anyone familiar with broach grinding.

All broaches have a short pilot at the starting end, the first broach having a plain round pilot and the second, third and fourth broaches having spline pilots to locate them in their proper position to follow the previously broached hole.

A thread of the opposite lead to the spiral cut, used for attaching a pulling shank is provided just ahead of the pilot. Broaches are made with a detachable shank to keep the length of the broach down to normal and so that they can be placed on centers and ground like any conventional broach. The shank,

(Continued on Page 36)



A close-up of the broach rack, the face plate and the master spiraling bar. This bar gives positive drive to the first broach which has a flat on the pull shank which engages in a four-jaw pull head. All other broaches have spline pilots for positive drive. Their drive is assisted by the spiraling bar through friction on the jaws in the pulling head.

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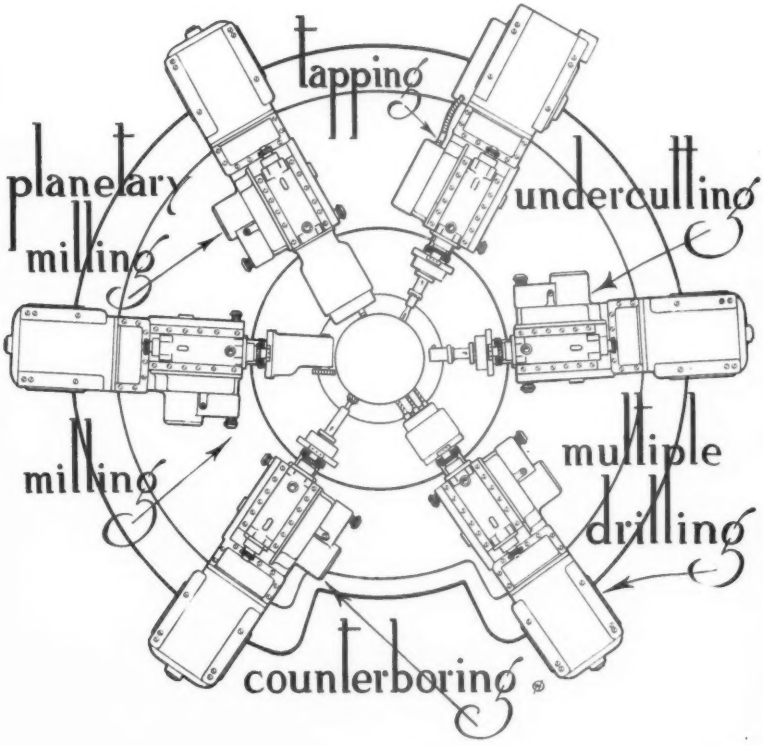

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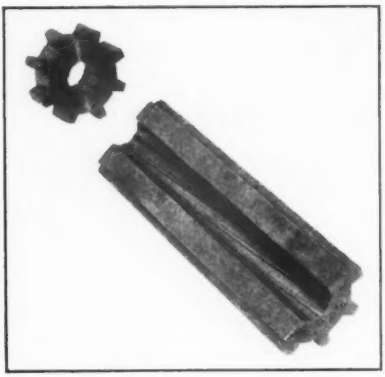
Write for Physical Dimension Chart

Rifling of Cannon by Use of Spiral Broaching Tools

(Continued from Page 34)



End and longitudinal views of section of the 20 mm cannon barrel showing spline grooves. In this gun the lands and grooves are constant through the rifled length.

being detachable, can be used indefinitely.

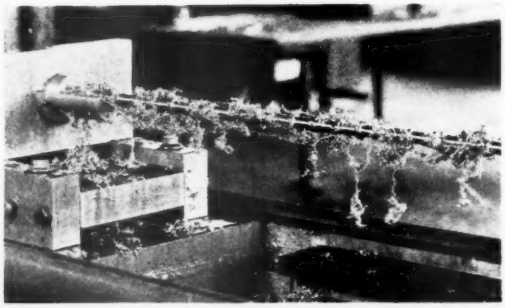
The tooth design of solid spiral broaches differs from conventional broach design. In the standard conventional tooth form the face of the tooth is undercut, with a width of tooth land provided, followed by a tapered portion or spool effect. It has been found that on this class of work that the taper or bevel portion back of the land should be cut straight to the bottom of the chip pocket to provide a shoulder for the chips to float against when the oil is forced into the bore during the cutting operation. In the conventional design there would be a tendency for the chips to float up on the tapered or the beveled back section angle and wedge between the tool and the work. This would cause considerable scratching of the bore and of the broached rifled grooves of the cannon.

The threaded portion for pulling these broaches has been made smaller in diameter than any other part of the broach. This is done purposely as a safety protection so that in the event of an accident the thread is always broken.

Broaches are designed to assure that each tooth takes a cut sufficient to prevent scraping or a tendency to alternately ride the stock and dig in periodically.

The machine developed for the broaching of these small cannon is a Pull Type machine, hydraulically operated, provided with variable speed control for the cutting stroke. On the operation of broaching 20 mm cannon it has been found that a cutting stroke of about 8 fpm proves very satisfactory.

Built in two sections, the right hand portion is the machine proper and contains the hydraulic equipment, pulling head, hydraulic oil reservoir, pressure gages, spiraling bar and electric motor. The left hand portion of the machine contains the work fixture, lubricating pump and motor and lubricating oil reservoir. The machine is so designed that at any future date the right hand portion can be used as a normal broaching machine for commercial broaching of all shapes of holes, including splines, straight and spiral, in such work as comes within its pulling capacity, and provides a broaching unit of an exceptionally long stroke for commercial broaching.



An experimental setup showing a broach at the end of a pull cut. Chips are thin, soft and very open because of proper stepping of the tooth and high turbulence of the oil forced through the entire length of the tool during cutting.

DoAll

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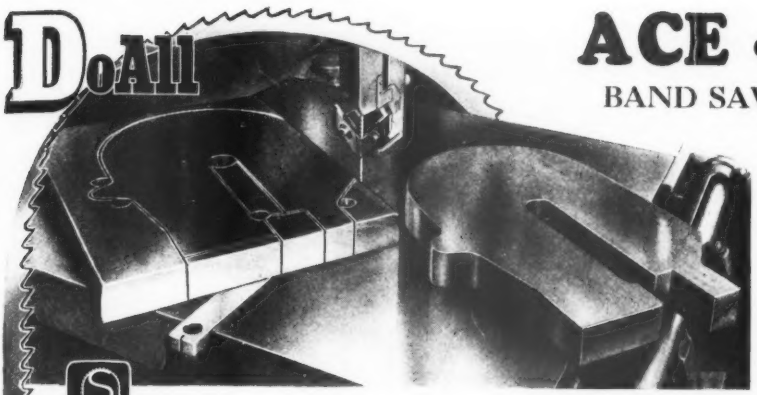

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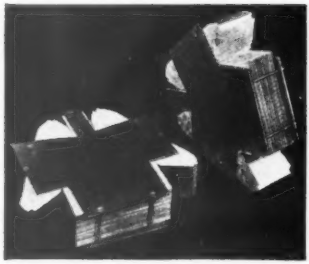

Shows how 40 to 60 metal sheets are clamped together and cut at one time with a DoAll Band Saw.

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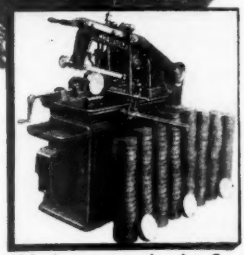

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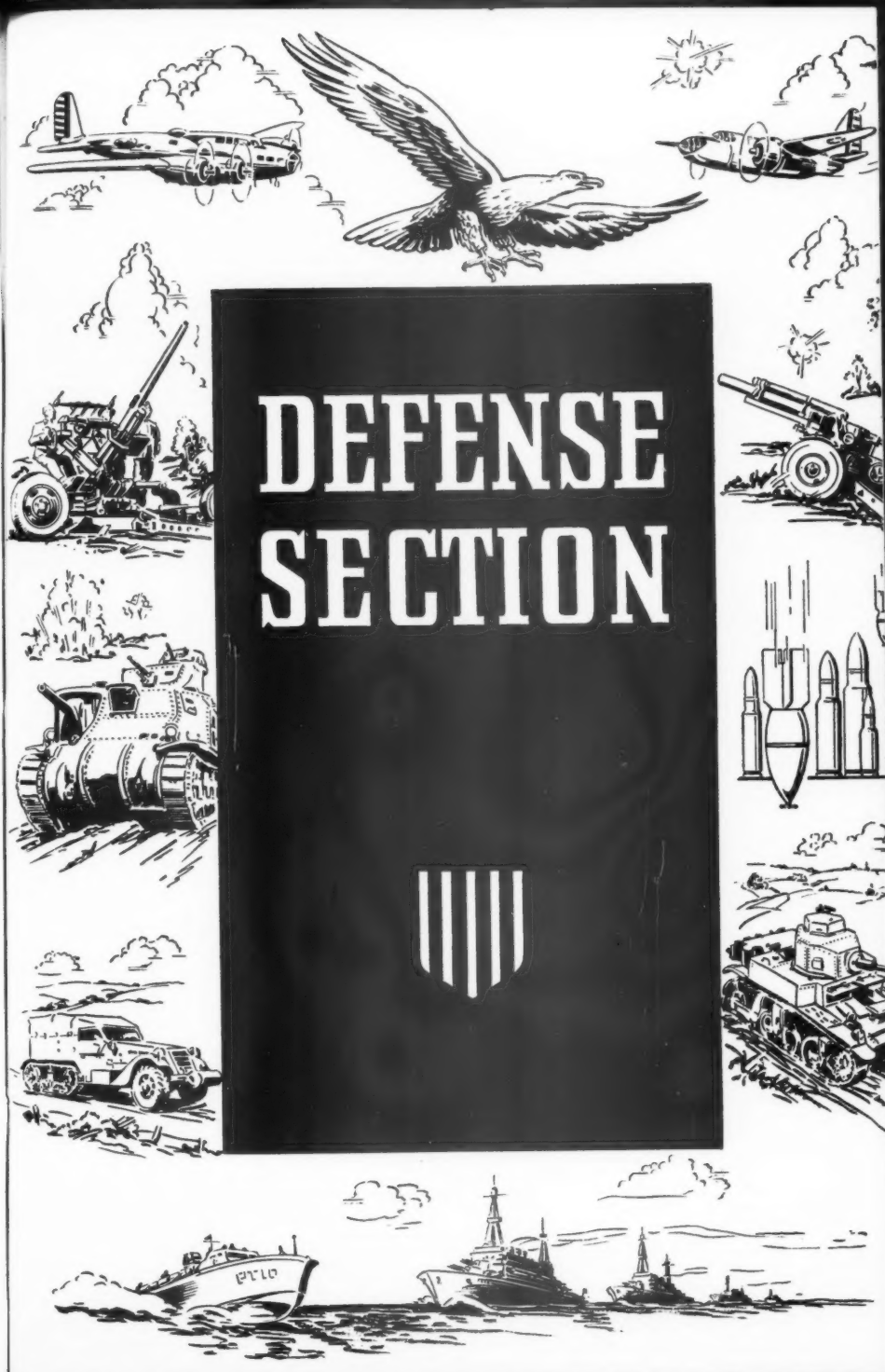

DEFENSE
SECTION

Letter from Washington

By George J. Huebner

THE Presidential Executive Order of September 4, which established the Division of Contract Distribution and appointed Floyd B. Odlum its Director, also set forth its objectives as:

"A determined move on the part of the Administration to help the smaller business units of the country obtain a fair share of the Defense orders, and to prevent, so far as possible, dislocation of industry and unemployment of workers in plants where production has been curtailed by priorities and material shortages.

"The program devised was arrived at in consultation with representatives of the Army, Navy, Maritime Commission, and OPM and has the full support of these agencies. The Labor Division and the (former) Defense Contract Service of OPM have already done a great deal in starting the machinery of subcontracting and in retraining and obtaining reemployment for discharged workers."

Under the direction of Deputy Director W. H. Wheeler, Jr., the DCD is now being greatly expanded as one of OPM's most important divisions.

Director Odlum's address of a few days ago, before the Mid-West Defense Conference at Kansas City, Mo., carries a timely and encouraging message for owners and operators of the Nation's so-called smaller manufacturing firms, their employees and their communities. He said:

"Two months ago, almost to the day, the President assigned me to a great and difficult task. It was in effect to mobilize the manufacturing resources of our nation for all-out defense.

"Three months ago I was a businessman who believed that business could cooperate with Government. Today, with my desk moved to Washington, I believe that Government can cooperate with business. And those beliefs of mine are daily being put to the test in actual practice.

"It is a war of materials—of manufactured products—that we are facing —so closely indeed, that at the moment we can see the whites of the eyes of the opponents. Ships, tanks and airplanes are the instruments used for destruction. They must likewise be the instruments of defense. A tank can't be stopped with a naked body nor an airplane with a slingshot."

He continues:

"The limitation on our production effort is, of course, the available amount of raw materials, such as steel, copper and the like. Naturally *all* civilian consumption requiring these same raw materials cannot cease. A balance must be struck as to how much shall be used for the sword of defense and how much for the plough share. That means allocations and priorities.

"Priorities are sharp in their impact. Plants that have been producing for civilian life heretofore, because that is what they wanted to do, find themselves suddenly faced with the necessity of shifting over to defense production or of stopping operations altogether.

"In the first phase of the defense program the orders for defense goods were placed, quite naturally, with the established large producers whose ability to deliver was well known to the armed services. The immensity of the job and its effect on the nation's economy could not be foreseen. It was for this reason that, as you may have

(Continued on Page 54)

George J. Huebner, publisher of The TOOL & DIE Journal, is acting as Tool and Die Consultant in the Division of Contract Distribution. Among the important projects he is actively engaged in, is the location of facilities for making dies, punches, gages and similar tools and parts for cal. .30 and cal. .50 cartridges for which there is urgent need since their production schedules are being continually increased.

Contract Tool & Die Shops and manufacturing plants with qualified tool room facilities and personnel for making such tools are invited to write for particulars or to contact DCD offices where drawings and specifications may be examined. If writing Washington, address George J. Huebner, Tool and Die Consultant, Div. of Contract Distribution, OPM.

Production Tools for the Manufacture of Small Arms Ammunition

Working Operations and Finishing Technique

Article Two of a Series

By Collin M. Doyle

Engineering Section, Military Division
Remington Arms Company, Inc.

This series, prepared by qualified engineers at the request of the Office of the Chief of Ordnance, covers data selected to give Contract Tool and Die Shops and departments of manufacturing plants a clear understanding of the requirements of the manufacture of small arms ammunition tools. Since enormous quantities of such tools are required shops, departments and manufacturing plants with facilities available for precision work are urged to get in touch at once with the nearest Division of Contract Distribution Field Office.

—The Editor

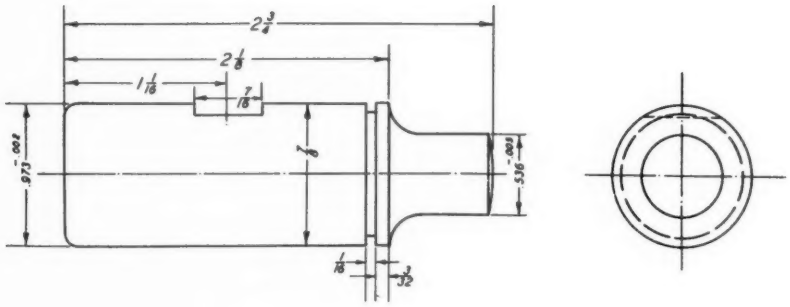
Heat Treatment

THE physical properties of the cartridge case for cal. .30 ammunition are not alone achieved by Metallurgical Heat Treatments. The working of the case mechanically plays an important part in the determination of these physical properties. One of the most significant operations in this connection is the "bump". It can readily be seen that after the fourth drawing operation the cartridge case is relatively hard, whereas the base of the case that receives little or no working from the blanking and cupping operation through the four draws, an anneal being given after each draw, is somewhat soft.

In order to avoid the condition known ballistically as "blown primers" it is necessary to work the base of the case to give this metal the necessary physical properties to hold the primer in position and keep it there under all conditions. Therefore, the bumping operation assumes one of importance and of course, the success of this operation is dependent entirely upon the tooling.

The Bumping Operation

The bumping operation is performed on a horizontal toggle press. The cartridge is fed to a cylindrical component holder by a locating punch. The locating punch is actuated from one end of the toggle press and the bumping operation is performed by the opposite end. The function of the component holder and the locating punch is to locate the component accurately for the bumping operation. The bumping punch is shown as Fig. 5. The machining of this bump-

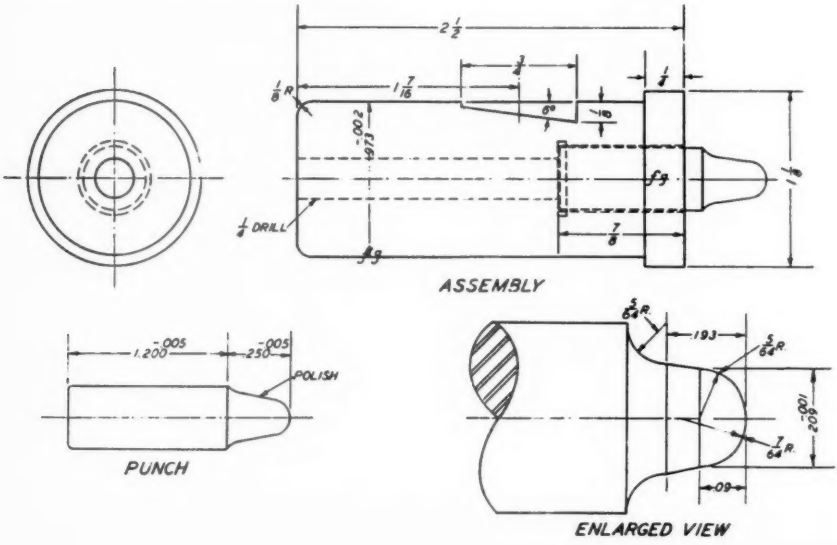


BUMPING PUNCH
Fig. 5

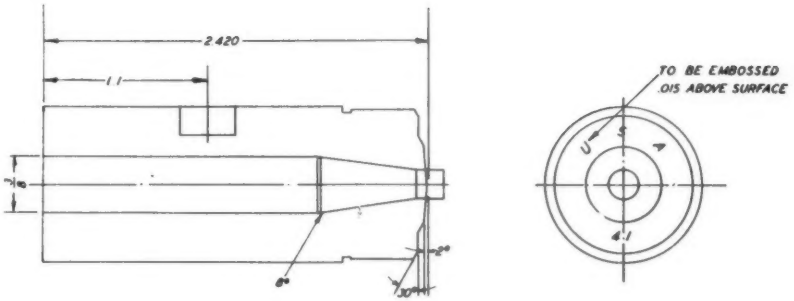
ing tool is relatively simple; the heat treatment is of the utmost importance. The life of this tool is dependent entirely upon the grade of hardness. Care must be taken in the heat treatment of this tool to avoid decarburization and oxidation. A sufficient amount of grind stock must be allowed to permit the tool to be machined so that any decarburized or oxidized area is removed, thus giving the tool a hardness that could not be otherwise obtained.

The Pocketing Operation

Following the bumping operation we have what is known as "pocketing". This pocketing operation is performed



POCKETING PUNCH
Fig. 6



HEADING PUNCH

Fig. 7

on an identical press to the bumping. However, the tool for this pocketing operation is not so simple. It is the function of the pocketing punch to actually preform the primer pocket. The pocketing operation is very similar to that of the bumping. The component is located into a cylindrical component holder by a locating punch. The life of this tool is dependent upon its hardness and polish.

It can be said that the life of this tool is proportionate to the type of polish. The polished surface of this tool should be of the finest and the polished lines should be parallel to the axis of the tool, not cylindrical. If the polished lines are cylindrical and at right angles to the axis of the tool, microscopic particles of the brass will adhere to its surface causing the pocketing tool to pull the cartridge case out of the component holder and remain on the pocketing punch so that the knockout striker cannot remove it. Obviously, on the next stroke an empty cartridge case will be forced against the cartridge case now held in the component holder with the possibility of a serious breakdown. Again, the heat treatment of this tool is of paramount importance, and the necessity of heat treating this tool in a controlled atmosphere so as to avoid decarburization and oxidization cannot be over-emphasized. Fig. 6 shows the general dimensions of this punch and the irregularity of the mass of this tool gives some indication of the difficulties that may be experienced insofar as the heat treating and especially quenching technique is concerned.

The Heading Operation

The subsequent operation to the pocketing is known as "heading". Of the three operations herein described, the most important is heading. The diameter and depth of the primer pockets is definitely determined by this operation and accuracy is of extreme importance. In addition to making the primer pockets to an accurate depth and diameter, this heading operation also identifies the component. It is the usual practice for the initials of the Ordnance Plant or Arsenal to be placed on the base of the cartridge case together with the year of manufacture. For example, if the cartridge case were manufactured in 1941, the numerals 41 would indicate that year. Fig. 7 shows the dimensions of this particular tool and the function of this press is identical to that of the pocketing and bumping operations. The component is located similarly but the operation of heading is much more severe than either bumping or pocketing and the life of this tool is considerably shorter than for either of the preceding operations. The greatest care must be exercised in heat treating this particular tool, especially because of the variance in mass.

Fig. 8 shows a section view of a quenching tank best suited for the heat treatment of this type of punch. Assuming the tank shown as Fig. 8 to be approximately three feet deep, a pressure line approximately 12" below the surface of the quenching agent should be installed. This pressure line can be used with either a water or oil quench. A

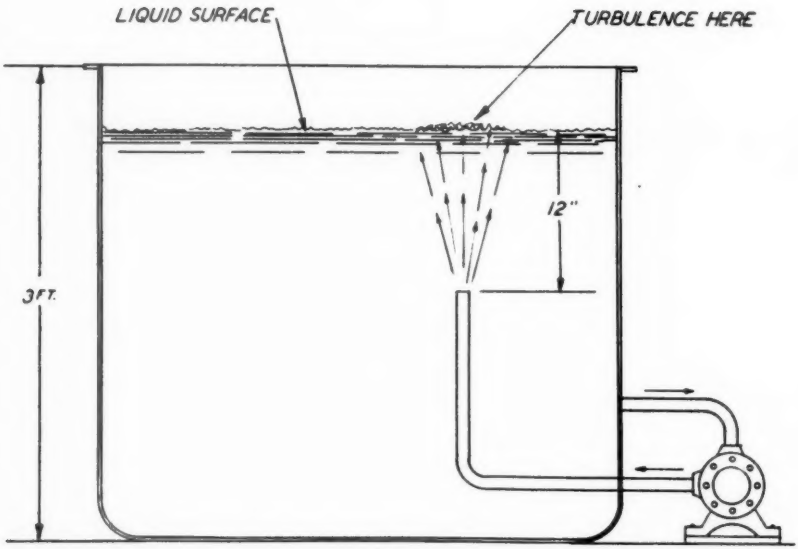


Fig. 8

suggested procedure for heat treating this punch follows:

After care has been taken to see that this punch is heated in a controlled atmosphere so that decarburization and oxidation is minimized, the quenching tongs should be heated to almost the same heat as that of the punch. After it has been ascertained that this tool has been brought to the required heat, the tool should be removed from the furnace by the heated tongs, being sure that the tool is being held by the very extreme base. The next point in this process is to immediately submerge the tool into the quenching tank being sure that the "teat-like end" of the punch is held to within 1½" of the pressure line. This would permit the quenching agent to exert its full effect on this small teat and force the heat withdrawal from the opposite end, thereby leaving the reduced area hard and minimizing the possibility of soft spots created by gas pockets. This technique when properly applied produces excellent results. The pressure of this line can easily be obtained by using a small recirculating pump.

Importance of Polish

Again, with this tool as with all other tools used in the production of small arms ammunition, polish is of the most importance. It cannot be overstressed that the necessity of the polish lines being parallel to the axis of the tool is of signal importance. If the polish lines are cylindrical, we again encounter the difficulties of the component being withdrawn from the component holder, creating a similar breakdown to that explained in the pocketing operation.

While it is not shown on the drawing, a slight taper is permissible and would permit the teat to be somewhat conical. In other words, the base of the teat would be slightly larger in diameter than the tip. An inverse taper, smaller at the base than at the very end cannot be accepted. An inverse taper would not permit the punch (which is also known as a "bunter") to be withdrawn from the component after it has formed the primer pocket.

Features That Contribute to Long Tool Life

In order to emphasize the importance of the heat treatment of this punch and the polishing, reference should be made to Figs. 7 and 8 to study the technique of Furnace Control quenching and

(Continued on Page 52)

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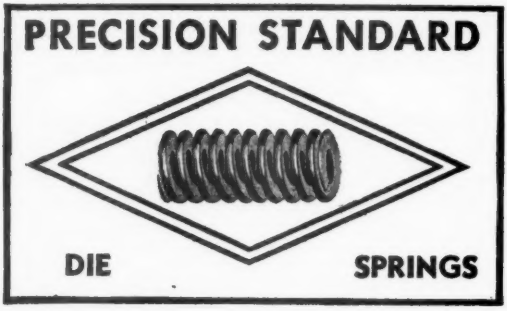

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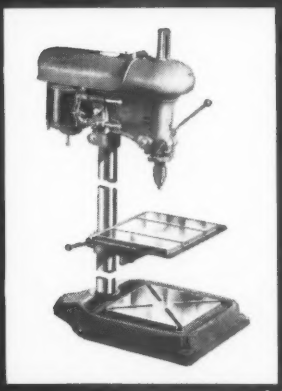

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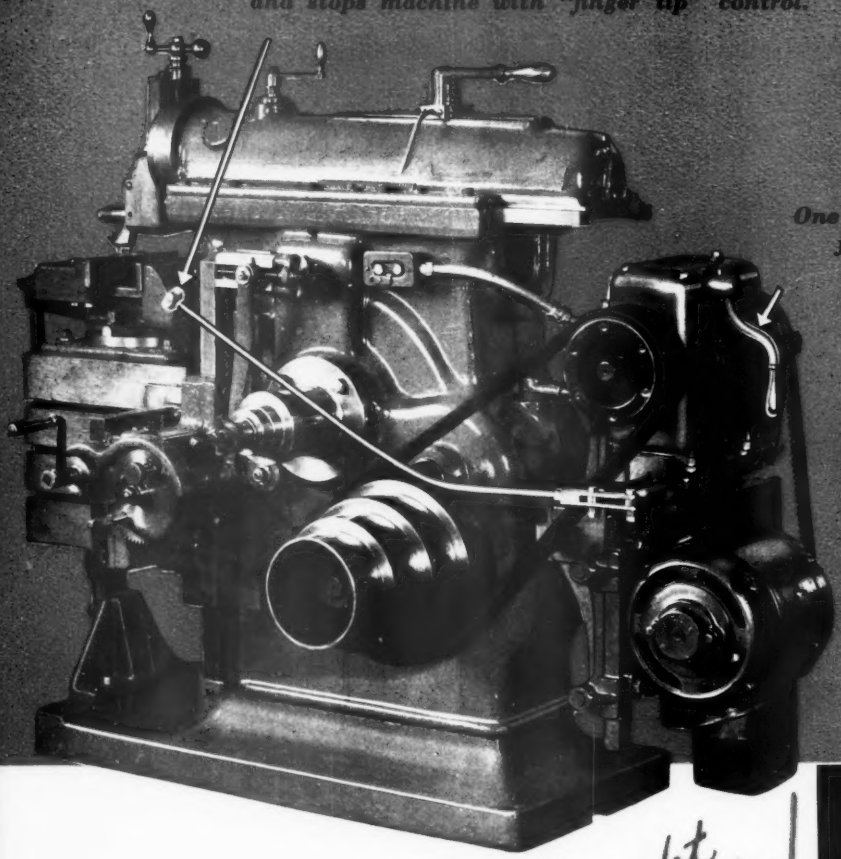

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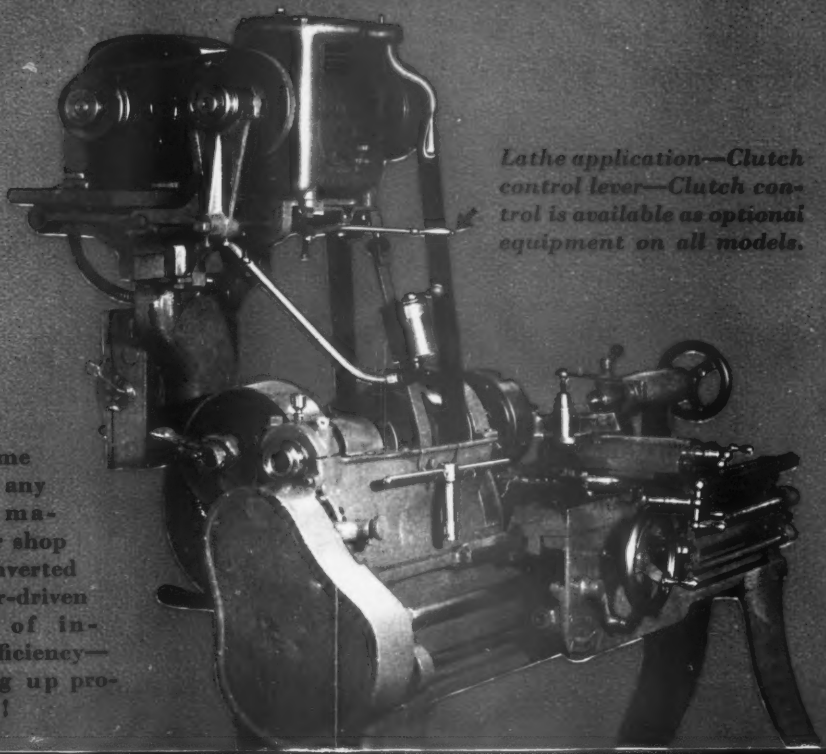

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Firth-Sterling Issues Users' Hand Book

A NEW 64-page Users' Handbook has just been issued by Firth-Sterling Steel Company, McKeesport, Pa. Divided into five sections, the handbook divisions treat of the nature and uses of the four standard grades of Firthite; styles, grades, specifications and adapted uses of general purpose tools; how to make Firthite tools; how to use and maintain them; and a Handy Data Section.

In the first section there is an excellent, easy-to-use table of the nature and properties of Firthite standard grades and of recommended uses. Specifications of five styles of general purpose Firthite Tools in four grades are given in the second section—two grades for cutting steel and two for cast iron, non-ferrous metals and non-metallic materials. A number of practical suggestions on adapting the five styles of general purpose tools completes the second section.

The four steps in making Firthite Sintered Carbide Cutting Tools are outlined step-by-step in the third section. With detailed illustrations and instructions any shop man can make his own Firthite Tipped Tools.

The fourth section outlines proper procedure in both application and maintenance of Firthite Tools. Data is included on making fluted tools, grinding form tools and cutting fluids. The fifth section lists Hardness and Metric Conversion charts, a Speeds and Feeds chart and a Cut-

(Cont'd on Page 53)

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PRODUCES *for Defense*

AMERICAN has produced broaching machines and tools which aid manufacturers in the production of all types of first line defense equipment.

AMERICAN broaching equipment is producing flats on the ends of tank track connectors. **AMERICAN** equipment is used by aircraft manufacturers for broaching propeller hubs, for broaching faces of split line bearings and many other operations. Openings in bearing cages for main crankshafts in torpedo boats are **AMERICAN** broached. Also on our roster are transmission and differential gears used in army "jeeps" and half-tracs. In addition to the above, **AMERICAN** developed the hydraulic push type rifling machine used for rapid rifling of 105 **MM** Howitzer barrels as well as the pull type rifling machines for various cannon down to and including the 20 **MM** Aircraft Cannon. Early in "Defense" **AMERICAN** supplied broaching equipment for production manufacture of receiver forgings for the Garand rifle.

It is through this wide variety of experience that **AMERICAN** is able to produce faster, finer and more accurate broaching machines and tools than have been turned out in the history of broaching!

AMERICAN BROACH & MACHINE COMPANY
ANN ARBOR, MICHIGAN, U. S. A.
BROACHING MACHINES, PRESSES, BROACHING TOOLS, SPECIAL MACHINERY

Division of

Working Operations and Finishing Technique

(Continued from Page 44)

machining, to produce a tool that will give satisfaction from a production standpoint. Satisfaction from a production standpoint means tool life. The life of a tool is judged by the successful number of components it will produce. Consequently, the features that will contribute to a long life tool are of utmost importance. These are as follows:

1. The selection of a good grade of steel.
2. The proper machining and leaving sufficient grind stock.
3. Heating in a controlled furnace so that no excessive decarburization or oxidation takes place.
4. To be certain that the technique of quenching is thoroughly understood.
5. Any drawing or tempering must be done positively by control, and not by the color method.

In finishing the tool, the grinder work must be performed with skill and the polishing operation before the tool is submitted to inspection must be of the very finest, paying particular attention to the fact that the polish lines must be paralled to the axis of the tool. If strict attention is paid to the foregoing, a usable and long life tool will be the natural result. Any departure from the technique explained in this article may produce a defective tool with consequent rejection.

Rejection Is Waste

Rejection is waste. It does not contribute to the success of the vendors' activities and may conceivably suspend production, for the want of a vital tool.

Suggestion is submitted for the consideration of those vendors who may be manufacturing a large volume of small arms ammunition production tools, that a considerable saving may be made, by periodically having a metallurgical examination of vital tools to determine the quality of the heat treatment. Taking for example, the "bunter" tool for the "heading" operation. It would be well advised, to take one of these punches that had been heat treated and cut it in half, polish it, and submit it to the Nital test. This test is made with 5 percent nitric acid in alcohol. The polished piece of the tool is immersed and agitated in this agent for approximately 10 to 15 seconds and when dried the hard areas shows up as light gray and any soft areas are dark.

Caution: No tempering should be done before making this test as a tempered tool will show dark areas, although of a different texture than soft areas. However, the results may be misleading if tempering is introduced before the Nital test. Using the Nital test, the results of heat treatment can be readily observed.

The third and concluding installment will appear in the December issue.

A ROUGH TOUGH JOB

Made Easy WITH

BISCO TOOL STEEL TUBING

Five sections of 7″ BISCO Tool Steel Tubing are used in the above die to stamp out circles of sandpaper. In spite of constant abrasive action, BISCO tubes offer rugged resistance.

No time or money are wasted on costly boring operations with BISCO Tubing. We cut it to any size from our warehouse stock and deliver it ready to use.

ALLOY STEELS
STAINLESS SHEETS AND BARS

Free Catalog on Request

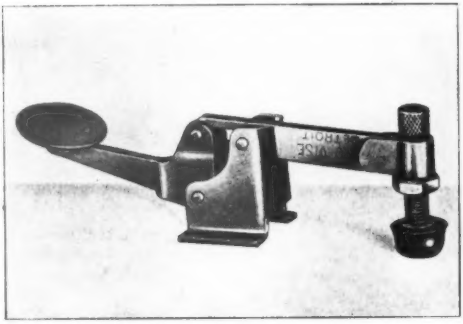
THE BISSETT STEEL CO.
943 East 67th St. · Cleveland, Ohio · HEnderson 0995

Knu-Vise Announces No. 830 Midget Toggle Clamp

KNU-VISE, Inc., Detroit manufacturer of toggle clamps and clamping fixtures, announces the Model No. 830 Midget Toggle Clamp. This clamp because of its great holding strength and small size is ideally adapted to aircraft work. Many other applications are practical because of the tremendous holding power and possible variations of a cam movement.

Model No. 830 Midget Toggle Clamp is furnished complete with spindle and rubber cap. The new clamp measures only 4" by 1½" high. The pressure obtained by this model—in excess of 500 pounds—**is unique.**

The Knu-Vise line of toggle action clamping fixtures now consists of 93 different models of clamps, pliers, plier-parallels, "C" clamps, riveters and drill fixtures. Six series of clamps altogether are available including the Klampacto "CEE" Clamp made in three throat sizes, with either smooth or threaded spindles. The Klampacto clamps combine the advantages of the conventional "C" Clamps with high speed toggle action.



For data sheets and prices of the new Model No. 830 Midget Toggle Clamp, write Knu-Vise, Inc., 16841 Hamilton Ave., Highland Park, Mich.

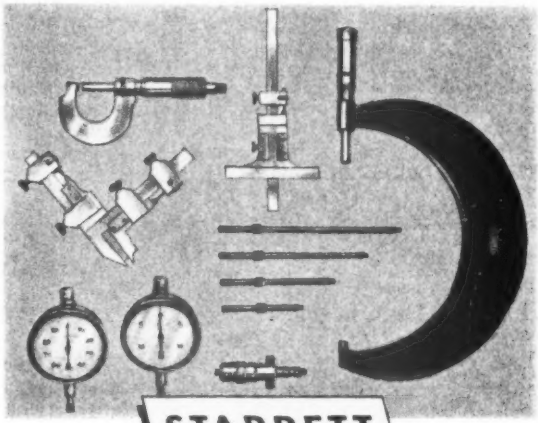
User's Handbook

(Cont'd from Page 50)

ting Speed Conversion Table.

The new Standard Tool Tip Sizes and Price List is also ready for distribution.

For your copy of Firthite "Users' Handbook of Sintered Carbide Cutting Tools" and new Standard Tool Tip Sizes and Price List, write Firth-Sterling Steel Co., Dept. TD, McKeesport, Pa.



THE L. S. STARRETT CO.

World's Greatest Toolmakers

Precision Tools . . . Dial Indicators . . . Ground Flat Stock Hacksaws . . . Metal Cutting Bandsaws . . . Steel Tapes

ATHOL, MASSACHUSETTS, U. S. A.

Standardize on

BUY THROUGH YOUR DISTRIBUTOR

Letter from Washington

(Continued from Page 40)

heard, about 75 percent of the initial defense orders went to a comparatively few firms.

"But all this must now change. All plants that cannot stay in civilian work and that have suitable machinery or tools should get into defense work . . .

"By bringing as many as possible of the small firms into defense work, two purposes are accomplished simultaneously.

"First, our defense effort is speeded up. A tank or an airplane now may be worth ten, two years from now.

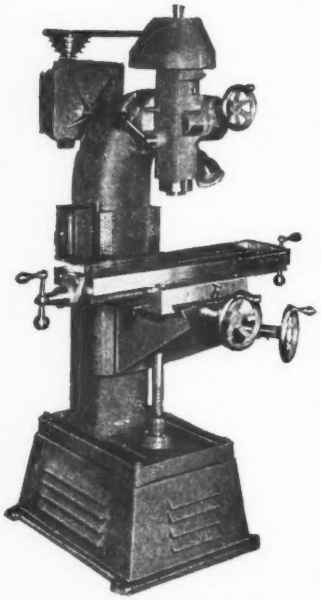
"In the second place, these factories are kept busy and are preserved for the soundness of our economic life."

It is estimated that there are at least 40,000 firms engaged in the metal working industries. Already more than 1,000 individuals are at work in Washington and in 60 DCD offices throughout the country. They are engaged in effective efforts to bring Defense orders to firms which need them and to make certain that no machine tools or other equipment with potential production or workers with needed skill or ability remain idle.

The so-called "manufacturing clinic" is the means for bringing together large defense contractors and prospective subcontractors. The method is an "across-the-table discussion" supplemented with drawings, specifications and even samples of the work to be done. Creditable results have already been attained and they will be apparent with increasing momentum as this "spread-work" technique becomes better understood. Mr. Odlum summarized:

"To be successful, this effort cannot come down only from the top. It must generate from the bottom in the small factories themselves. They must try to figure out what they can do and set about doing it. We can only help. Small factories that cannot do defense work singly should get together with other plants in production pools. . .

The solution is in the interests of big business as well as little business. American industry, working together, can solve this problem."



Our Prompt Deliveries are Helping to Speed the

DEFENSE PROGRAM

Jackson No. 2
Vertical High Speed

Milling Machines

A new plant with increased facilities has made it possible for us to accept a limited number of orders for prompt shipment. High Grade in every respect and especially designed for High Speed Precision and Production Milling and Boring.

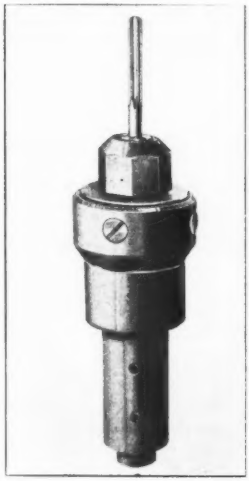
Wire, Phone or Write

Jackson Machine & Tool Company Sales Division
956 Roberts St. Jackson, Michigan

Universal Engineering Offers New Floating Chuck

A NEW floating chuck, designed especially to operate in a horizontal position in automatic screw machines and turret lathes has recently been announced by Universal Engineering Co., Frankenmuth, Mich.

The chuck uses a ball bearing drive both for the lateral movement and for thrust. The weight of the various tools can be counterbalanced by adjustment and in this manner increased feed can be used with a chuck of this kind without danger of marring or causing bell mouthed conditions. The spring pressure is from four different directions and can be increased or decreased in any direction by means of the adjusting screw. Since



the chuck operates in the same vertical plane at all times there is no dogtail motion.

Free descriptive literature on the new Universal floating chuck may be obtained from the manufacturer, Universal Engineering Co., Dept. TD, Frankenmuth, Mich.

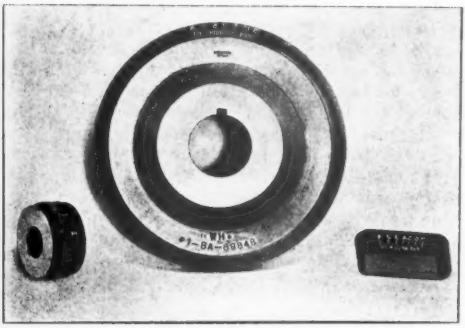
Reed-Prentice Opens Ohio Office

REED-PRENTICE Corporation announce the opening of a district office in the Penton Bldg., 1213 W. 3d St., Cleveland, O. A. R. Morse will be in charge of both sales and service engineering and maintenance on Reed-Prentice injection molding machines and machine tools including engine and toolroom lathes, vertical milling and die sinking machines and jig borers. The territory to be covered on the molding machines from Cleveland is all of Ohio except Toledo, and Indiana except for the metropolitan Chicago area. On machine tools the northern half of Ohio, including Columbus and the same Indiana territory will be covered.

Accuracy UNBELIEVABLE
Dumore Precision Grinders are used to achieve fine symmetry and remove irregularities from the sensitive gut strings of fine violins. Thus the true tones of the world's masterpieces are assured. Such delicate precision grinding must achieve unbelievable accuracy.
A Dumore No. 11 grinds a small bushing with uncanny precision. Designed to offer the advantages of larger Dumore Precision Grinders, at low cost. Wt. 11 lbs., ⅛ H. P. motor. Speeds to 30,000 R. P. M.
Small but mighty is the Dumore No. 14 Tom Thumb, here used in sharpening a hob. Has pre-loaded ball bearing spindle with positive lubrication, removable tool post and interchangeable chuck set-up for internal work. Wt. 6¼ lbs., ¼ H. P. Universal motor. Two speeds —10,000 and 22,500 R. P. M.
Dumore PRECISION Grinders
WRITE FOR VALUABLE BOOK ON PRECISION GRINDING
The Dumore Co., Dept. 371-L
Racine, Wis.

New Method Steel Stamps Broaden Marker Line

AN expanded line of markers of various types suitable for cutting slots, notches, knurls, serrations, graduation and calibration lines on machinery, ordnance, dials, indexing or calibrating collars or rings, bevelled discs, etc., is now offered by New Method Steel Stamps, Inc., Detroit, Mich.



Markers of the roll type may be employed in any lathe where the calibration lines and serrations need not be precisely indexed around the circumference or periphery of the parts. It is possible for the calibration lines to be limited to a portion of the circumference or periphery, the marker being equipped with stops that prevent repeating the design or markings even though the lathe or screw machine spindle on which the part is mounted continues to rotate.

Proper registering devices to suit the design of the specific pieces on which the lines or serrations are to be cut may be obtained. The markers are available either with or without corresponding numerals. In some cases the numeral may be added by a separate marker after the calibration lines have been made on the part.

Graduation markers are also available with bevelled edges or may be of disc type for producing serrations on the sides of collars and ferrules. Sizes range from micrometer thimbles up to large calibrated hand wheels on machinery.

Further information on this greatly expanded line of graduation markers may be had by writing to New Method Steel Stamps, Inc., 147 Jos. Campau, Detroit, Mich.

Carried in Stock

We carry complete lines of Socket Head and Common Screws, Hex Nuts, Dowel Pins, Layout Fluid and other Die Maker's supplies.

Cerromatrix

Cerrobend Cerrobase

Distributors of

Hardsteel Drills

We assemble and ship Producto Die Sets from our own warehouse.

Prompt, Dependable Delivery Service

DIE SUPPLY COMPANY

J. R. Fitzsimmons W. H. Fitzsimmons Jos. T. Fitzsimmons

Telephone CHerry 6818

1390 East 30th St. Cleveland, O.

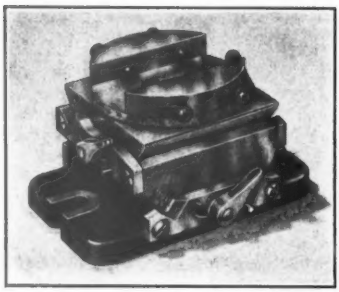
Hammond Any-Angle Tool Vise to be Sold Separately

THE Hammond Any-Angle Tool Vise, a tool holder providing grinding-angle adjustment on three separate planes and originally designed for grinding chip-breaker grooves into the tips of carbide tools, has been placed on the market as a separate unit by Hammond Machinery Builders, Inc., Kalamazoo, Mich.

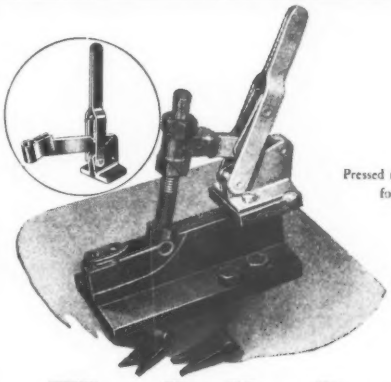
The Any-Angle Tool Vise, previously furnished as part of the Hammond "4" Chip Breaker Grinder, is complete in itself, being mounted on a lug base which is easily attached to a machine table.

A double-cradle principle of construction permits adjustment of grinding angles on three separate planes. Two steel blocks, machined to close tolerances and with rounded bases, are cradled into each other at right angles. After adjustment, they are locked together solidly by tightening cam locks which operate in machined segments at the ends of both blocks. A flat circular piece is mounted over the blocks as shown. This piece, free to swivel 90 degrees from center of any of the four sides of the block immediately below, carries the vise jaws, holding tools firmly by means of Allen screws.

Angular readings on each block are clearly marked. Each tilts 15 degrees either way from horizontal, and this adjustment combined with 360 degrees selectivity of the circular piece at top provides practically any angle desired.



Descriptive literature and prices on the Any-Angle Tool Vise will be sent promptly. Address Hammond Machinery Builders, Inc., 1631 Douglas Ave., Kalamazoo, Mich.



Pressed metal part held in fixture for milling operation

What Do You Require of

Toggle Clamps?

To hold parts in fixtures . . . in exact position . . during every phase of manufacture or assembly . . . for one second or one hour . . . To clamp positively . . . To release instantly . . . To reach maximum production . . . To stand up under extreme service . . . These are the functions that De-Sta-Co Toggle Clamps ably perform.

Bulletin No. 41, showing sizes and giving detailed specifications, will be sent you on request.

DETROIT STAMPING CO.

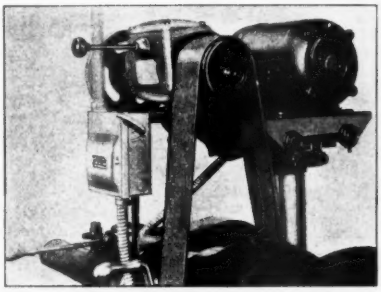
Established Over 25 Years

344 Midland Ave • Detroit, Mich.

"Flying Squadron" of DCD

FLOYD B. ODLUM, Director of the Division of Contract Distribution of OPM, announces the formation of a "Flying Squadron" of 50 engineers to determine whether industries threatened with priorities unemployment can be adapted or converted to Defense production. Requests for surveys by one of these engineers should be made through your nearest DCD office.

Western Improves Master Transmission Drive



AN improved and more compact Master transmission, designed for motorizing cone driven machine tools with 1 to 5 hp motors and for heavy loads with transmission case and covers of semi-steel castings that are oil-leak proof, is announced by Western Mfg. Company, Detroit, Mich.

The gears and spline shafts are of alloy steel, accurately machined, heat treated and ground. All revolving shafts are mounted on anti-friction bearings. All moving parts run in an oil bath, with plugs provided for filling and draining; oil seals are provided where necessary.

Like the former Master transmission and its companion the Western Major for 5 to 10 hp motors, the improved Master unit with three models of Multi-Motor Mounting is adaptable to all kinds of machine tools. The lathe bracket is designed to motorize automatics, bolt cutters, Fellows gear shapers, vertical milling machines, radial drills, turret lathes and screw machines; the shaper bracket to motorize boring mills and vertical mills; the third bracket designed to drive milling machines.

For literature and price of the streamlined Western Master Transmission address Western Mfg. Co., 3425 Scotten Ave., Detroit, Mich.

specify JESSOP CNS DIE STEEL

JESSOP CNS is a high carbon-high chromium die steel which combines high wear resistance with minimum size change when hardened. It is finding more and more applications in Defense plants where long die runs are customary. JESSOP CNS is an air- or oil-hardening die steel intended for general purpose work where some degree of shock resistance is required.

SEND FOR FREE FOLDER

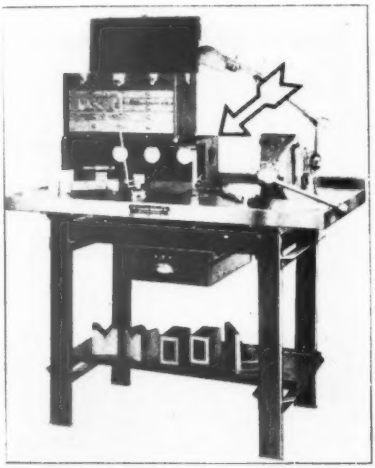
Bulletin 441, recently printed, contains complete information on JESSOP CNS Die Steel. Write for your free copy—today.

★★★ JESSOP STEELS Serve NATIONAL DEFENSE

JESSOP STEEL CO. WASHINGTON, PA. FINE JESSOP STEELS

JESSOP STEELS OF AMERICA
JESSOP STEEL COMPANY
General Offices and Works
WASHINGTON, PENNA. U. S. A.
CARBON · HIGH SPEED · SPECIAL ALLOY
STAINLESS and COMPOSITE STEELS

Challenge Announces New Tool Box Shelf



A NEW tool box shelf, providing a convenient place for the tool box so that it is within easy reach of the worker yet out of the way of his work, has been designed by The Challenge Machinery Co., Grand Haven, Mich. Being above the bench, the tool box drawers may be opened without moving anything on the bench top, thus making it almost entirely available as working space.

The new tool box shelf may be attached to any new or old challenge cast iron top bench, which is built of iron and steel, solidly braced to remain rigid under heavy pounding, shocks and pressure. The cast iron tops are preferred to wood in modern plants because they do not splinter, shrink and because they are more accurate. The top surface and sides are planed at exact right angles and the underside is heavily ribbed for reinforcement. Solid corners keep the surface firm. Two full braces under the table, equipped with levelling screws, assure a level working surface.

Challenge benches and tops are available in four regular sizes. The tool box shelf and a semi-steel drawer, with or without lock, are optional.

Descriptive literature and prices will be sent promptly upon request. Address Challenge Machinery Co., Dept. TD, Grand Haven, Mich.

New Die Book

The second edition of "Die Designing and Estimating" is virtually a new book, 160 pages of shop data. *See pages 84, 86.*

Chip Breaker grooves properly ground into carbide tools mean higher, more efficient production. Roll into high and stay there with HAMMOND'S new CHIP BREAKER GRINDER "4" (above). ANY-ANGLE adjustment, quickly, accurately, with sensational new tool vise. Write for Bulletin TODAY!

KEEP CUTTING TOOLS SHARP WITH
HAMMOND
CARBIDE GRINDERS

Hammond Machinery Builders INC.
1631 DOUGLAS AVENUE • KALAMAZOO • MICHIGAN

Grinding Equipment for the Tool Room and Die Shop

(Continued from Page 30)

speed of 19,000 rpm (full load 12,000 rpm) and are equipped with a ¼" single purpose chuck which holds a variety of shaped wheels and burrs. Used "free hand" the B & D Grinders are ideal in finishing work in the tool room and for grinding out intricate contours on experimental pieces, on dies, jigs and fixtures.

The universal motor was specially designed with the idea of keeping it to a minimum diameter for easy hand use. The Die Grinders may be equipped with either bonnet switch, switch in line or extended end handle with switch mechanism. Switches and commutators are dust sealed; the straight line ventilation has ample outlet slots to minimize the possibility of clogging the ventilating system. The Black & Decker Die Grinders are especially popular in cleaning and sharpening dies that have been in use and require rehabilitation.

Skilsaw, Inc. also make a complete line of portable electric tools which includes the Skilsaw Hand Grinder. This tool, weighing only 3 pounds and operating at a speed of 18,000 rpm (idling speed), takes a maximum wheel size of 1½" x 1" face. With an overall length of 11" and a diameter of 3⅛", the Skilsaw Hand Grinder is designed equally well for intermittent or continuous service—from "roughing-out" to "final finish". The illustration of the Skilsaw shows a typical application, grinding off clearance on a die punch.

The motor frame is made of molded bakelite for cool, comfortable handling; the front frame is of aluminum with rubber sleeve. High speed precision ball bearings on armature and shaft are grease sealed against dirt and dust. The air cleaner, enclosed in a metal cap, is a bronze wool filter, oiled to pick up solid particles. The positive grip precision chuck is case hardened. The Skilsaw Hand Grinder uses a wide variety of wheels and high speed rotary files . . . . operates from an ordinary light socket.

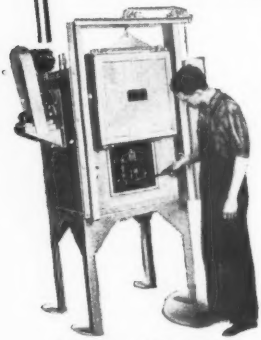
Dremel Model 2 Moto-Tool is one of the small (6⅝" overall, weight 13 ounces) high speed (27,000 rpm) precision tools that literally has hundreds of uses in the tool room and die

(Cont'd on Page 62)

New Metals, New Processes Need

DESPATCH FURNACES

TEMPERING · DRAWING
TOOLS · DIES · PRECISION PARTS
also NON-FERROUS CASTINGS



Today there need be no heat treating bottlenecks. Despatch Horizontal Flow Tool Room Furnaces will speed heat treating to handle top production. Speedy pre-heating and temperature changes are accomplished with the Despatch heat distribution and air circulation system. Heat uniformity ± 5° F. is guaranteed in the work chamber. Despatch Horizontal Flow Furnaces are available in a wide range of sizes for improving heat treating in the tool room and in production.

Write for Bulletin No. 83-0 for complete information, specifications and prices.

Accurate — Uniform — Flexible — Convenient — Speedy.
Range 275° F. to 1250° F.

DESPATCH OVEN CO.
MINNEAPOLIS · MINNESOTA

MAKE HASTE *QUICKLY* with UNBRAKO

Reg. U. S. Pat. Off.

Knurled SOCKET HEAD CAP SCREWS

Famous for years!

No premium price!

Wherever cap screws are used, you can speed up schedules and make it easier for your mechanics by switching to "Unbrako" *Knurled* Cap Screws.

The knurling gears right to the fingers . . . prevents annoying, time-wasting slip . . . keeps the mechanic happy because he prefers to use his fingers instead of a wrench. The smooth band at the base of the head serves the purpose of taking radial thrusts . . . and the knurling permits quick, easy locking of the screw after countersinking.

Because of the speed-up advantages, "Unbrako" is being specified exclusively by an ever-growing list of companies.

Make your next order *Knurled* "Unbrako" Socket Head Cap Screws . . . prove their worth on your own production line!

The KNURLING of Socket Screws originated with "UNBRAKO" years ago.

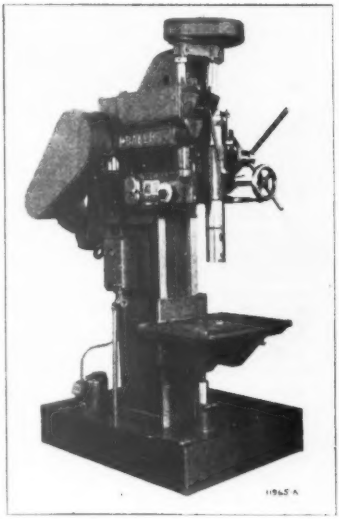
STANDARD PRESSED STEEL CO.

Box 600 JENKINTOWN, PENNA.

BAKER

HEAVY DUTY DRILLS

Geared and Hydraulic Feeds



Model No. 314-A Single Spindle Universal Quick Change Type Heavy Duty Drilling Machine—Geared Feed.
Capacity—up to 3" diameter drill in solid steel.

FEATURES

1. Heavy multi-splined spindles.
2. Speed box gears finished by shaving and "Fellows" Flame hardening.
3. Two-piece vertical column design.

Write for new circular

BAKER BROS., INC.

TOLEDO OHIO

Grinding Equipment

(Continued from Page 60)

shop. Small enough (1¼" diameter) to get into intricate openings or to follow difficult irregular contours, the Moto-Tool develops surprising power. It is a practical tool for work on almost any material.

The oversize armature shaft is hardened, ground and polished. Oversize, oil-less trouble proof bearings are self-aligning. An instant action wrenchless chuck takes collets in three different sizes. A patented automatic chuck lock pin disengages automatically, preventing motor from burning out. An air cooling system, equipped with easily removable screen to prevent dust from entering motor, allows continuous use without overheating. A sliding type switch is provided in a convenient position on the bakelite shock-proof housing.

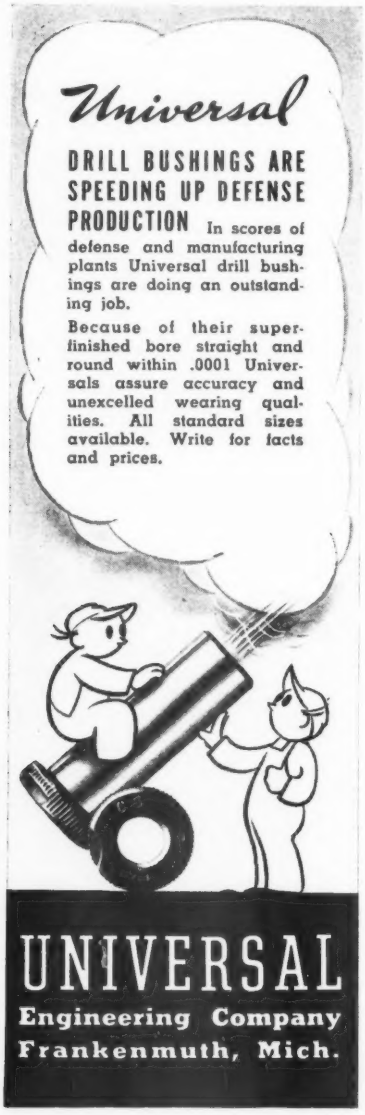
Two Duro Hand Grinders

Duro Metal Products Co. build two hand grinders—the Heavy Duty Grinder and the Streamline Grinder. The Heavy Duty Grinder is equipped with a General Electric universal motor dynamically and statically balanced, series wound for maximum performance. The motor has a standard commutator with machined V grooves and steel clamping rings as used on power drills. Square cartridge type brushes ride on the peripheries of the commutator—not on the end—assuring better performance and longer life. The spindle operates on wide New Departure Precision Ball Bearings totally sealed. The propeller type fan insures a cool running unit. The Heavy Duty Grinder is precision machined throughout—bearing seats for example are bored to .0002".

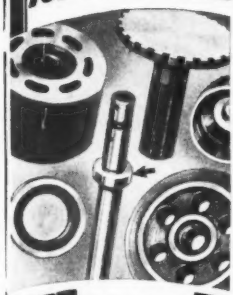
A specially designed threaded type collet chuck of capacity up to ⅛" overhangs the housing only ⅝". A patented lock operated by a button locks the shaft so that the chuck may be easily tightened or loosened. The unit which weighs 3 pounds and runs at 24,000 rpm is said (by the manufacturer) to develop more power per ounce of weight than any other unit on the market.

The Duro Streamline Grinder also equipped with a General Electric motor unit is a companion tool to the Heavy Duty Grinder with many of the same construction features of the larger, heavier unit. The Streamline Grinder is only 6⅜" long and weighs but 12 ounces. Its small, slender shape makes it extremely useful for grinding, polishing, drilling, etc. in hard to get at places. Specially designed collet chucks hold 3/32" and ⅛" shanks. An opening at front of housing is provided for chuck holder to

(Continued on Page 64)


Universal
DRILL BUSHINGS ARE SPEEDING UP DEFENSE PRODUCTION
In scores of defense and manufacturing plants Universal drill bushings are doing an outstanding job.
Because of their superfinished bore straight and round within .0001 Universals assure accuracy and unexcelled wearing qualities. All standard sizes available. Write for facts and prices.
UNIVERSAL
Engineering Company
Frankenmuth, Mich.

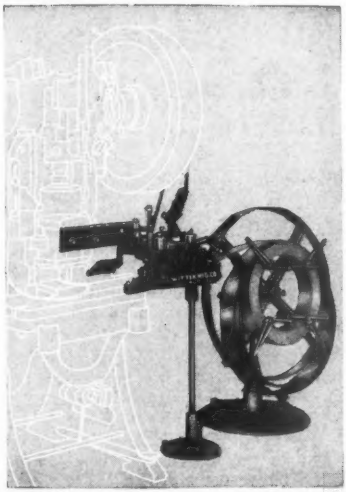
Flatter, Smoother, Surface Finishes for YOUR PRODUCTION PARTS ★★★



IF YOU make aircraft landing gears, thrust bearings, oil seals, valve plates, tool blocks, seal rings, clutch plates, refrigerator seals or other parts that call for a precisely flat, smooth surface finish. . . . Ultra-Lap will finish such parts for you, to an optically flat surface . . . to specifications for flatness of one light band or less . . . to a smoothness finish as low as one micro-inch R.M.S. . . . any metal or material, or any combination thereof. Now serving leading manufacturers in the Aircraft, Automotive, Refrigerator and other fields . . . we engineered and are builders of the famous Ultra-Lap Machines with which this Lapping work is done. Send your specifications for estimate of cost to:

Ultra Lap Machine Company
245 McDOUGALL AVE., DETROIT, MICH.

WITTEK *Automatic* ROLL FEEDS AND REEL STANDS



★ FOR ANY MAKE OR SIZE PUNCH PRESS

Wittek Automatic Roll Feeds provide an improved and simplified method of punch press operation that insures rapid feeding under all conditions. Wittek Roll Feeds handle any type of coiled strip stock and are made in single roll, double roll, and compound types with straighteners, in models to feed in any of four directions.

Wittek Adjustable Reel Stands provide automatically expanding coil holders that center the coil and assure maximum production by eliminating looping, tangling and backlash of stock.

If your production problem involves feeding coiled stock to punch presses, it may be solved by consulting us. Your inquiry will be given immediate attention. Send for complete descriptive catalog.

WITTEK MANUFACTURING CO.
4305 W. 24TH PL., CHICAGO, ILLINOIS, U.S.A.

Speed Your PRODUCTION

3 0 DAY TRIAL OFFER

BACK OUT BROKEN TAPS *with* WALTON TAP EXTRACTORS

Broken pieces are backed out easily and quickly without annealing or drilling or damage to threads. Stock sizes from No. 4 machine screws to 1½" in 2, 3 or 4-flute types.

World-wide acceptance for 30 years proves the value of Walton Tap Extractors.

Write for Circular 132. Select your sizes and put them to work at our risk.

THE WALTON CO.

88 Allyn Street Hartford, Conn.

Grinding Equipment

(Continued from Page 62)

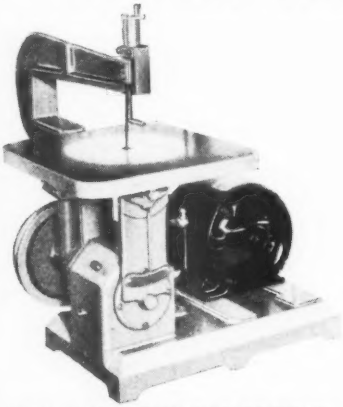
lock the shaft when tightening or loosening chuck.

The Clark No. 0 High Speed Ball-Bearing Die Grinder is a product of James Clark, Jr. Electric Co., Inc., "first in the field". This company, manufactures radial drill presses, motors and generators, as well as a complete line of hand drills, sanders and polishers, lathe and bench grinders. The United States Navy has purchased Clark grinders regularly since 1902. The Clark Die Grinder is 10⅞" in overall length, weighs 4½ pounds and is fast—20,000 rpm (no load). Its weight is distributed to assure precision work. An exclusive feature of this die grinder is that it is protected from overloads by replaceable fuses. A small fuse box mounted on the housing is equipped with time lag fuses which permit a momentary overload without kicking out. The grinder will cease to operate on overloads in excess of one minute. Fuses can be replaced without disturbing electrical connections.

Article 4 on Pneumatic Grinders will appear in an early issue.

Why Wait?

New **ATLAS DIE-FILING MACHINES**



Now Available for

IMMEDIATE DELIVERY

Can be used for all kinds of die making. The overarm is constructed so that the file and saw attachments may be interchanged with little effort. The holddown fingers are attached directly to the overarm. Working surface of the table, which tilts two directions, is entirely clear. An improved type of chuck, consisting of movable hardened jaws, holds both saws and files. Screw adjustment makes changes easy and fast.

The ATLAS Die-Filing Machine has every possible advantage for rapid and accurate diemaking — AT A BIG SAVING OF LABOR.

ATLAS EQUIPMENT COMPANY

101 S. Clinton St. Chicago, Ill.

Price, complete with motor—

$125.00 Net

F. O. B. CHICAGO

FlexoiD Industrial Couplings

with Thermoid Hardy Discs

no metal-to-metal bearing surfaces. Provides strong, durable, pliable joint requiring no lubrication — no attention.

STOCKED FOR IMMEDIATE DELIVERY

FlexoiD Tool Holders

with Universal Head

"It's all in the Tool"

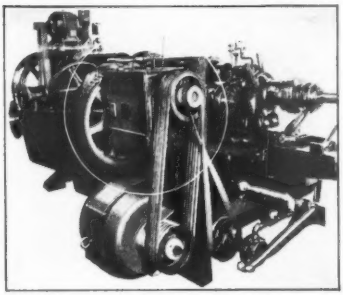
No need of right, straight or left-hand shank tool holder when using FlexoiD hard alloy Tool Holders.

ONE TOOL DOES IT ALL
30-DAY TRIAL OFFERED

FlexoiD SPeed Control

Units convert old line shaft driven machine tools into modern individual drives.

So Be Wise—Motorize!



FlexoiD Unit Applied to Cleveland Automatic

Write for name of nearest distributor and Circular TD.

The Smith Power Transmission Co.
1545 E. 23rd St., Cleveland, Ohio

JOHNSON FURNACES

Save
—Time
—Gas
—Space

You can save up to 2½ production hours—and that means real money—by using this Johnson Furnace No. 120. In addition, Johnson Furnaces reach maximum temperatures in less than 30 minutes—and save up to one-half the gas consumption of ordinary furnaces. They are compact units that require little floor space. Johnson No. 20 Hi-Speed Steel Furnace gives 2300° F. in 30 minutes. Use for heat-treating high speed and carbon steels, for hardening punches, dies, parts, and cutting tools. Complete with motor and blower, $129.50 F.O.B. Factory.

(Prices subject to Change without Notice)

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USE COUPON

Our 40TH ANNIVERSARY YEAR
JOHNSON GAS APPLIANCES
FOR EVERY INDUSTRIAL PURPOSE

D

Johnson Gas Appliance Co.
611 E Ave., NW.
Cedar Rapids, Iowa

Please send me new Johnson Gas Appliance Catalog

Name .....
Address .....
City .....**State** .....

PROGRESS

The Racine Hydraulic Heavy Duty Metal Cutting Machine illustrated is cutting a tool steel block in the Havrill Aircraft and Die Casting Corporation, Inglewood, Calif. This unit, a standard machine made by Racine Tool & Machine Co., 1768 State St., Racine, Wis., is used for making dies for airplane parts and cutting tools. This machine will cut tough SAE 4150 steel (for armor piercing shell), six 3½" bars at one time in 7½ minutes per cut. This type of saw is particularly valuable in refacing and reclaiming of old dies. For complete information, ask for Catalog 80-B when you write.

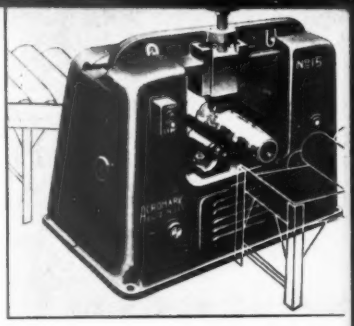
•

The illustration at left is the Holo-Krome TEN-TOR Machine used for testing and determining the various physical properties of Holo-Krome Fibro Forged Screws under the identical conditions in which they are used in Industry. The machine is a development of The Holo-Krome Screw Corporation, Hartford, Conn. The chemist shown on the left is studying the grain texture of a screw which is in the process of being tested. This company constantly studies the metals which are used in the manufacture of their products. They believe that progress in their manufacture must first be accomplished by progress in the accurate analysis of metals.

•

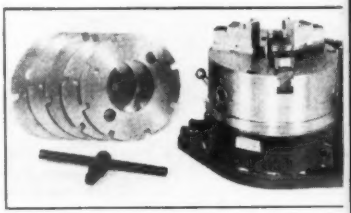
The Ex-Cell-O Heavy Duty 14-inch Wheel Double End Tool Grinder is now in production according to the Ex-Cell-O Corporation, 1202 Oakman Blvd., Detroit, Mich. It is designed for either wet or dry grinding of carbides or tools of other materials. This grinder, known as Style 49, is the sixth and largest of the Ex-Cell-O line of carbide tool grinding machines. Bulletin No. 46511 gives complete details.

SS on PARADE



The new AcromarK No. 15, a high production shell marking machine, is the latest product of The AcromarK Corporation, 261 N. Broad St., Elizabeth N. J. The unit, mounted in a sturdy cast iron housing, utilizes the principle of the shaper, the heavy slide marking a shell on either forward of backward stroke by rotating the shell. The No. 15 is designed to use flat dies or type for marking, not only less expensive than rotary dies but adapted to other types of marking work, insuring that the machine's usefulness will continue past the present emergency. For complete information, address The AcromarK Corp.

●



The Hartford Super-Spacer, manufactured by The Hartford Special Machinery Co., 281 Homestead Ave., Hartford, Conn., is designed for rigid control of accurate machining operations. Indexing is rapid, positive and accurate. The reversible jaw self-centering chuck provides a secure means for holding work. This universal fixture is adaptable for milling, drilling, boring, planing and slotting. A new circular illustrating numerous setups will be sent on request.

●

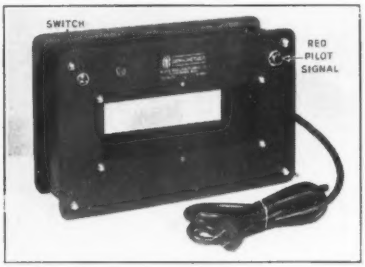
The Illinois Tool Works, 2503 N. Keeler Ave., Chicago, Ill., are manufacturers of the Die Filing Machine shown at right. The unit, mounted on a cabinet base and tool tray, is designed for filing intricate die shapes. In accurate die work where frequent removal of the die from the machine is necessary this machine is valuable because the file can be quickly released and the overarm moved to clear the die. Another exceptional feature of the machine is a pressure oiling system providing a constant stream of oil to all moving parts. An interesting circular is available.

●

The dovetail forming cutters illustrated below are a development of The Forging and Casting Corporation, Ferndale, Mich. With high speed steel becoming more scarce, every tool room is vitally interested in making this metal go as far as possible. A 50 percent saving is claimed by the use of FCC Electrically Welded Composite Steel Cutter Blanks. A non-hardenable, tough, mild steel base minimizes tendency to crack and break out at sharp dovetail corners and screw holes. Machining operations may be performed after hardening if desired. A special method of electric welding provides an inseparable bond between the cutting base and face. A special Bulletin containing full particulars is now available.

AMC DEMAGNETIZER

A Tool Room Necessity



Every tool room needs this simple, portable, sturdy demagnetizer. Small parts passed through the powerful AMC field are instantly demagnetized. Large, flat surfaces can be demagnetized by sliding the device over the surface.

Price is only $32.50, complete as shown.

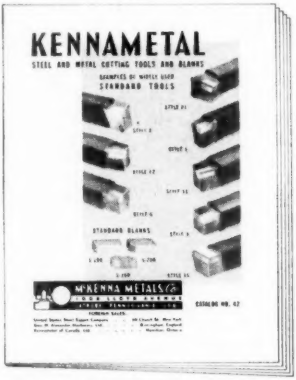
Write for full information.

ALOFS MFG. CO.

1619 Madison Ave., S. E., Grand Rapids, Mich.

McKenna Metals Co. Issues New Kennametal Catalog

McKENNA Metals Company, Latrobe, Pa., has just issued a new catalog, No. 42, covering specifications and prices of standard Kennametal steel-cutting carbide tools and blanks.



Typical applications of each style of

(Continued on next Page)

OLIVER DIE MAKING MACHINES

Automatic Drill Grinders, Tool and Cutter Grinders, Face Mill Grinders, Template Tool Bit Grinders.

Will increase the efficiency of your Tool and Die Departments.
They are fast and efficient on all sawing and filing operations.
They *save* 50 to 60% of the labor over hand methods.
Available in nine styles.

* * *

CONSERVE your high speed cutting tools by increasing tool life.

STOP wasteful Hand Grinding.

INVESTIGATE the Oliver line of Tool Reconditioning Machines; get the most out of your Cutting Tools through increased output between grinds and less wastage in the Grinding Operation.

SEND FOR LITERATURE

OLIVER INSTRUMENT CO. 1436 Maumee Street, East, Adrian, Michigan

tool are illustrated by line drawings, and photographs and information on specific examples of the use of various guides of Kennametal have been included. Several pages are devoted to selection and design of tools and blanks, correct grinding procedure, chip breaker designs, brazing tool blanks to shanks, boring tool set-ups and other pertinent engineering data. The new Kennametal round shank boring tools, cut-off tools, roller type turning tools and solid round tools are illustrated and described.

Kennametal Catalog No. 42 will be furnished at your request. Address McKenna Metals Co., 500 Lloyd Ave., Latrobe, Pa.

Sheffield Promotes Technical Men

Mr. Fay Aller, formerly Chief Engineer of the Gage and Machine Tool Division, has been named Director of Research; and Mr. Albert Wartinger, formerly Chief Engineer of the Tool and Die Division, has been appointed Chief Engineer of the Sheffield Corporation, Dayton, O. Mr. Aller has been with Sheffield for 8 years; Mr. Wartinger for 15 years.

DCD Opens Additional Offices

IN the last 30 days the following offices of the DCD have beer, opened. These are in addition to the list published on page 40 of the October issue:

Albany, N. Y.
State Bank Bldg., 75 State St.

Dayton, Ohio
1021 Third National Bank Bldg.
32 North Main St.

Portland, Maine
Room 501-502, 443 Congress St.

Rochester, N. Y.
Chamber of Commerce Bldg., 55 St. Paul St.

Spokane, Wash.
629-630 Old National Bank Bldg.

Springfield, Ill.
307 First National Bank Bldg.

Springfield, Mass.
95 State St.

Syracuse, N. Y.
Chamber of Commerce Bldg., 341 Warren St.

Wheeling, W. Va.
Hawley Bldg., 1025 Main St.

Worcester, Mass.
State Mutual Bldg., 340 Main St.

Youngstown, O.
1002 Union National Bank Bldg.

Another "Hit" for Defense Production

the Jackson No. 1 Horizontal MILLING MACHINE

The new Jackson No. 1 Horizontal Milling Machine is designed for tool room, experimental and production work that can be most efficiently and economically done by a small precision unit.

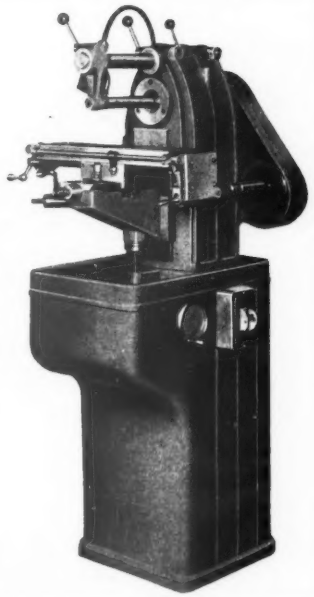
The new mill—quality built of high grade materials—will handle 3/8" cut, 3/4" deep in solid steel at one cut. Cutter capacity 1/2".

Production in our new enlarged plant permits best possible deliveries.

Full specifications sent promptly.

Wire, Phone or Write

Jackson Machine & Tool Company Sales Division
956 Roberts St. Jackson, Michigan



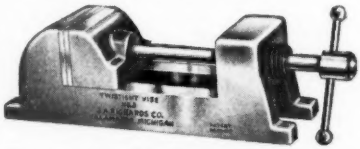
In hundreds of shops, ILLINOIS Die Filing Machines are turning out accurate work many years after their original purchase. Experienced diemakers who have operated various types of filing machines know that an ILLINOIS is quality built throughout and will stand up longer, while producing more accurate work. Write for descriptive literature today.

ILLINOIS TOOL WORKS
2503 N. Keeler Ave. Chicago, Illinois

ILLINOIS DIE FILING MACHINE

Richards Adds Twistite Vise

J. A. RICHARDS CO., Kalamazoo, Mich., is now offering the Twistite Drill Press Vise No. 3 for use in tool rooms, die, mold and other precision work shops. The vise has a jaw width of 3" and is instantly adjustable.



To operate, the handle of the vise is turned to the left until the smooth rod is free. A pull then opens the vise to any desired capacity. To close, the handle is pushed until the movable vise jaw contacts the work. A twist to the right applies the pressure.

For complete information on the new Twistite Drill Press Vise No. 3 write J. A. Richards Co., 900 N. Pitcher St., Kalamazoo, Mich.

—USE MAGNI-RAY FOR INSPECTION—

MAGNI-RAY, the new illuminated magnifier, REVEALS DEFECTS such as:

- Burrs and poor finish on small parts, pins and screw machine products.
- Cracks in steel after hardening.
- Imperfect welding seams.
- Blow holes in castings, machine tool beds, tools and dies.

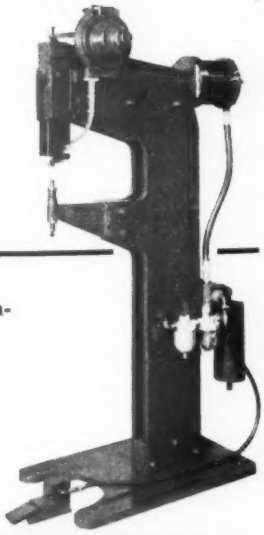
You'll find the Magni-Ray a great improvement wherever a clear examination of work is required. Light shines directly upon the work from two sides and new, patented construction prevents glare. Magnifier may be removed from stand for observation of work in machine. The MAGNI-RAY is available in two standard magnifications, one with special corrected achromatic lens, without distortion.

Write today for literature.

GEO. SCHERR CO., 128-B Lafayette St., New York, N. Y.

handles flush riveting
AIR SQUEEZE ACTION plus
AUTOMATIC FEED RIVETING
for AIRCRAFT PRODUCTION

the Air Powered
RIVITOR



it's fast
1600 riveted joints per hour with no manual rivet handling. This is an average figure. Increased or lowered production depends on the ease with which the work can be handled.

it's simple
therefore economical to maintain.

Write for particulars to
THE TOMKINS-JOHNSON CO.
630 N. Mechanic St. Jackson, Mich.

this is a **TOMKINS-JOHNSON** *product*

ACME INDUSTRIOGRAM

SEAL IT TIGHT - MOUNT IT RIGHT - USE ACME FLAT LAPPING - LESS THAN FIVE MILLIONTHS INCH FROM ABSOLUTE FLATNESS BY MECHANIZED PROCESS INSURES BETTER VALVE OR ROTATING SEAL PERFORMANCE - CUTS COSTS AND SIMPLIFIES YOUR ASSEMBLY PROGRAM . . .

ACME INDUSTRIAL COMPANY

★ Acme flat lapping provides a perfect seal because the mating surfaces can be finished to within .000005 inch from absolute flatness. This, together with correct mounting, insures a seal which is initially tight and will remain so indefinitely. Acme Advice Is Yours For The Asking.

Answer This Message Today!

★ Find a better solution to *your* sealing problem. Send blueprint or sketch of your seals, or details of your sealing requirements where fluids must be retained around rotating shafts, or by disc type valves.

ACME INDUSTRIAL COMPANY
Makers of Standardized Jig and Fixture Bushings
206 N. Laflin St. Chicago, Ill. MONroe 4122

Recent Industry Publications

ESSENTIAL FACTS ABOUT GRINDING—"What, Why and How," intended primarily for apprentices, trade and technical school students and the many new operators of grinding machines, covers in question and answer form general information on grinding and grinding machines. Many cross-sectional views and photographs of machines with parts indexed will prove of interest and value. Copies of "What, Why and How" will be sent by the Norton Company, Worcester, Mass., at your request.

ULTRA-CHEX FOLDER—A new 8-page folder, just issued by the George Scherr Co., Inc., 128-B Lafayette St., New York, N. Y., devotes two pages to the uses of optical parallels and flats, with actual charts in five colors giving a simplified explanation of the light interference theory. A number of photographs show gage blocks in use to set adjustable limit snap gages, sine bars, checking micrometers. Still another chart illustrates ways in which gage blocks may be used, in inspection, in setting up machine tools and other shop uses to increase production accuracy. A copy of the new Ultra-Chex Folder will be sent promptly.

NEW BROWN & SHARPE SMALL TOOL CATALOG—A new Small Tool Catalog—No. 34—a 512-page book, is now ready for distribution. A complete line of machinist's precision tools, screw machine tools, pumps, milling cutters, hobs, arbors, adaptors and collets as well as many other tools are shown. A copy of Catalog No. 34 will be sent on request made to Brown & Sharpe Mfg. Co., Providence, R. I.

FLEXOID SPEED CONTROL UNITS—The Smith Power Transmission Company has issued Bulletin FD, which describes and illustrates their Flexoid Speed Control Units for converting every type and size of line shaft driven lathe, drill press, milling machine and grinder to individual motor drives for efficient operation and tool rooms and die shops. The 3 models, adaptable to almost any machine and permitting economical routing of all jobs, have a horsepower range of 1 to 10. The single handwheel cam control governs 4 speeds and 4 ratios. A neutral position between each range insures speed control at all times. The Smith Power Transmission Company, 1545 E. 23d St., Cleveland, O., will send a copy of Bulletin FD upon your request.

LESLIE PUNCH PRESS—Bulletin 941 describes this hand punch press, which was developed primarily for short production runs on large sized sheets where low die cost is essential. The Leslie hand punch press, hand operated, has capacity to blank a 2" diameter hole in 10 gage mild steel and a 4" x 4¼" punch plate for accommodating even larger dies. Specifications and prices are given. A copy of Bulletin 941 will be sent upon request by the Leslie Welding Co., 2941 Carroll Ave., Chicago, Ill.

CULLMAN MACHINE TOOL DRIVES—Typical installations of the Cullman Drive, an individual motor unit designed to eliminate counter shafting and overhead belting, are shown in Folder CW-32; eight advantages of their use are included. A table gives complete specifications and prices for Cullman Lathe Drives, Shaper Drives, Milling Machine Drives, Punch Press Drives and for Cleveland Automatic Screw Machines. Folder CW-32 will be sent by the Cullman Wheel Co., 1332 Altgeld St., Chicago, Ill., at your request.

HY-TEN AND SAE ALLOY STEELS—Removable Data Sheets, bound in a single volume, cover the composition, heat treating instructions and physical properties of Hy-Ten and SAE alloy and special steels. The qualities of each type of steel, their common uses and the sizes carried in warehouse stocks—all briefly and completely listed—will prove convenient for the purchasing executive busy with Defense orders. A copy of Catalog 7, containing the Data Sheets, will be sent by Wheelock, Lovejoy & Co., Inc., Cambridge, Mass.

OLIVER DIE MAKING MACHINES—Bulletin 641 describes and illustrates the complete line of Die Making Machines manufactured by "Oliver of Adrian". This company, originators of the idea of sawing out dies and flat metal specialties, makes 9 types of machines in 3 sizes to meet every sawing and filing requirement. A copy of Bulletin 641 will be sent promptly by the Oliver Instrument Co., 1436 E. Maumee St., Adrian, Mich.

NEW ACME INDUSTRIAL CATALOG—A.S.A. Standard Drill Jig Bushings Catalog No. 7 is ready for distribution. For convenience A.S.A. Standard Bushing data is printed in green, Acme Standard Bushing data in red. Data on Acme Standard Dowel Pins, Liner Pins and Bushings for Die Casting Dies, Leader Pins, Floating Reamers and Holders and the Acme Monochromatic Light (helium for extremely accurate vertical measurements) are also included. A table giving increase or decrease in sizes of machined steel parts due to differences in temperature of room and of parts to be measured will be of interest to many. Address Acme Industrial Co., 206 N. Laflin St., Chicago, Ill.

SEVERANCE TOOLLOG No. 13—describes and illustrates the line of Rotary Power Tools manufactured by the Severance Tool Co., 1506 E. Genesee Ave., Saginaw, Mich. A brief description and specifications for each tool are given. Toollog No. 13 explains the system of ordering by letter symbols, a system pioneered by the Severance Tool Co. Send for your copy.

UNBRAKO SCREWS—Bulletin 558, issued by the Standard Pressed Steel Co., covers their entire line of Unbrako Socket Screw products. Brief, yet concise descriptions of each screw, with actual shop photographs, illustrating their use, and diagrams showing their compact design, make this book valuable to the tool room and die shop man. Bulletin 558 explains why the Knurled feature of Unbrako Screws is a great time saver on production work or in dies where the screws frequently must be inserted and removed by the die maker. Send for your copy of this instructive Bulletin. Address Standard Pressed Steel Co., Box 600, Jenkintown, Pa.

Delta Mfg. Co. Offers New 17" Power Feed Drill Presses

A NEW and improved type of low cost power feed drill press has just been announced by The Delta Mfg. Co., Milwaukee, Wis. The unusual design of the power feed unit, which operates directly off the bottom drive of the motor instead of the spindle, makes possible a wide range of feeds, from .001 to .016 inches per revolution of spindle in the slow speed drill presses and from .0005 to .009 inches in the high speed machines. Two 4-step cone pulleys and a special belt tension release make feed speed changes quick and safe.

The heart of the power feed is the husky bronze gear and the specially hardened and ground steel worm that assure positive, accurate stopping and long satisfactory service.

Sensitive hand drilling and heavy power feed drilling operations are handled with equal ease and accuracy. A flip of the power lever sets the machine for the power feed; another flip of the lever and the hand feed is set. The change is speedy, simple and safe.

As a time saver, the new Delta power feed drill presses are the last word. The operator can bring the drill down to the work in one swift motion, by hand; with

(Continued on next Page)

File Figures *that every file user should know*

This is the number of different kinds or shapes in which "American Swiss" Swiss-Pattern Files are available.

Moreover, the many cuts and sizes in which each of these "American Swiss" file shapes is made cover a wider range of requirements than any other commercial Swiss-Pattern Files.

This is only one of the many good reasons for standardizing on "American Swiss."

Buy from our Distributor

ONLY THE BEST

American Swiss File & Tool Co.
ELIZABETH, N. J.

AMERICAN
SWISS PATTERN FILES

Tools with reputation

Chicago Rawhide Hammers and Mallets, manufactured from genuine Java Water Buffalo hide, are made by a firm with fifty years experience in producing quality products from rawhide. These tools make pounding safe on easily damaged surfaces. They are enduring. They are accurate. Rawhide does not "mushroom", crack or crumble. Even in unskilled hands they are safe because rawhide, tooled, compressed and tightly rolled, has resilience which cushions hard blows.

● **Chicago Rawhide Hammers are made with malleable heads and replaceable faces. Mallets are made in a dozen sizes to meet every requirement.**

CHICAGO *Rawhide* MFG. CO.
1280 ELSTON AVE · CHICAGO · U·S·A·

Delta Power Feed Drill Presses

(Continued from Page 73)

a flip of the power lever he can set the machine for the power feed. While the drill press completes the drilling cycle, he can pass to another operation—loading another jig or working on another spindle. The drill automatically returns to its original position upon completion of the drilling operation. The automatic stop assures uniform depth of holes to close tolerances.

Other special features include: safety lock for preventing damage to drill press when power feed is disengaged; adjustable automatic stop and return. This new line includes single and multiple spindle 17" units, in slow speed and high speed models, with table-raising or head-raising mechanisms, powered with either Delta or standard NEMA frame motors —all priced considerably lower than the customary price ranges for drill presses of this quality.

Ask for your copy of "Power Feed 17" Drill Presses" just issued. Write Delta Mfg. Co., 611-L E. Vienna Ave., Milwaukee, Wis.

Have you ordered your copy of "Die Designing and Estimating?" See Page 86.

Complete Manufacturing Facilities

Over 50,000 Square Feet of Floor Space

TOOLS, DIES GAGES JIGS, FIXTURES
SPECIAL MACHINERY METAL SPECIALTIES
JIG BORING DESIGN AND DEVELOPMENT

Punch Presses
Kingsbury Drilling Machines
High Speed Tapping Machines
Multislide

Injection Moulding
Spring Winders
High Speed Blanking
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New Majestic Internal Grinding Machine

Designed to meet the requirements of most tool room internal grinding operations.

Equipped with Parker spindle and motor. The nose of the hollow spindle is ground for use of collets—with outside threaded for adaptors and a face plate. Parker ball bearings and standard rotor and stator assure perfect balance for smooth spindle movement. Parker spindle is available in several sizes.

Work head is readily adjustable, with graduated base which swivels 90 degrees on each side of center for taper grinding. A three step V-belt pulley drives an intermediate three step pulley on adjustable countershaft, which, in turn, has a V-belt drive to the main spindle.

The Majestic Internal Grinder is furnished with two section type table, mounted diamond dresser, and coolant tank designed for filtering and equipped with a ⅛ HP motor driven centrifugal pump.

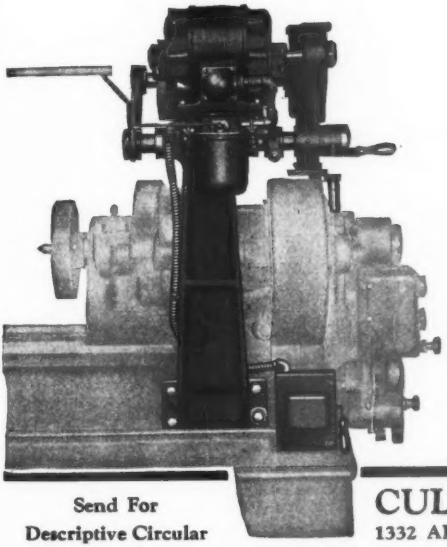
Write for new descriptive circular.

2946 Woodbridge St., E.
Detroit Michigan

MAJESTIC TOOL & MANUFACTURING CO.

MOTORIZE WITH *CULLMAN DRIVES*

for NATIONAL DEFENSE



Rigidly constructed and easily installed on lathes, shapers, milling machines, punch presses, these drive units are designed to increase machine efficiency 25% or more and still retain belt drive smoothness.

Efficiency of old machinery which has been pressed into service due to Defense demands can be increased to equal that of new equipment. Machines equipped with Cullman Drives require less space and may be arranged to obtain better lighting.

Cullman Drive Units are made in sizes for motors ranging from ¼ to 15 hp.

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Descriptive Circular

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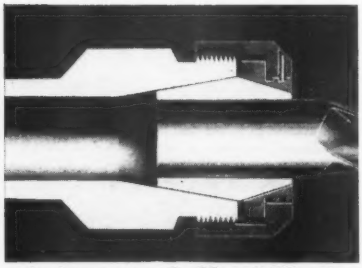
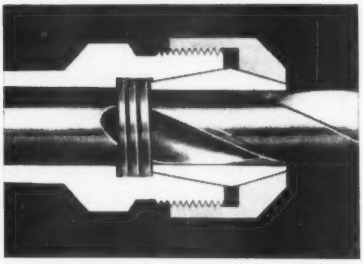
O'Neil-Irwin Adopts "Di-Acro"

The O'Neil-Irwin Manufacturing Company, 815 Eighth Ave., S., Minneapolis, Minn., has adopted the trade name "Di-Acro" for its products which up to this time have been known as the Micro Bender, Micro Brake, and Micro Shear.

2 NEW FEATURES IN UNIVERSAL COLLET CHUCKS



In larger sizes Z, ZZ and XZ nut tightens against a floating sleeve which reduces locking effort by 50%. Nut is jet black and fluted for tightening with a spanner wrench.



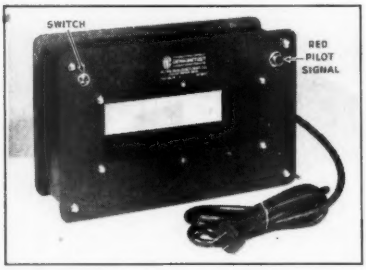
In smaller sizes OW, WW, and Y a release spring forces collet forward, as nut is loosened, automatically releasing the grip on the tool.

UNIVERSAL
Engineering Company
Frankenmuth, Mich.

AMC Introduces Portable Tool Room Demagnetizer

A CONVENIENT portable demagnetizer designed for tool room use is offered by Alofs Mfg. Co., Grand Rapids, Mich. The AMC Demagnetizer is light in weight—the frame is vulcanized fiber—extremely durable and easy to move over large flat surfaces or to carry from job to job in the shop.

A small part or piece—even of the hardest magnetized steel—can be demagnetized instantly by passing it through the AMC Demagnetizer. The Demagnetizer also will magnetize parts of hard steel by applying the part to the demagnetizer and shutting off the current. The unit comes completely equipped



with pilot light or signal and cord ready to use. The unit is made in one standard size (overall 4" x 13" x 7⅞", opening 2¾" x 8¼") but larger sizes can be furnished on special order.

Write for new circular on the AMC Demagnetizer. Address Alofs Mfg. Co., 1619 Madison Ave., Grand Rapids, Mich.

We Correct an Error

In a story in our October issue regarding the leadership of Ohio Tool Company Cleveland, Ohio, in the manufacture of small arms ammunition tools, it was erroneously stated that this company began the manufacture of such tools on December 15 of last year. This company, according to L. E. Butzman, owner, has been making small arms ammunition tools since November 1939. Also, the name of the company is Ohio Tool Company, not The Ohio Tool Company, as the first sentence of the story may have indicated.

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This directory of products lists for ready reference the names of manufacturers and dealers whose sales to The TOOL & DIE Journal readers have established them as dependable in every sense of the word. They merit your consideration.

Complete information about any product may be had upon request made to the firm listed or to us.

Your mention of The TOOL & DIE Journal will be appreciated.

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Starrett Company, L. S. Athol, Mass.
The Tannewitz Works, Grand Haven, Mich.

BAR STOCK—Heat Treating
Lakeside Steel Improvement Co., 5418 Lakeside Ave., Cleveland, O.

BARS—Rolled Composite
Forging and Casting Corp., Ferndale (Detroit), Mich.

BENCHES
Challenge Machinery Co., Grand Haven, Mich.

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Johnson Gas Appliance Company, 611 E. Avenue, NW, Cedar Rapids, Ia.

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Danly Machine Specialties, Inc., 2100 So. 52nd Ave., Chicago, Ill.
Die Supply Co., 1390 E. 30th St., Cleveland, O.
Holo-Krome Screw Corp., Hartford, Conn.

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BURNERS—Gas
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Danly Machine Specialties, Inc., 2100 So. 52nd Ave., Chicago, Ill.
Danneman Company, F. C., 203 Lafayette St., New York, N. Y.
Die Supply Co., 1390 E. 30th St., Cleveland, O.

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Universal Engineering Co., Frankenmuth, Mich.

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Starrett Company, L. S., Athol, Mass.

CAMS
Gorton Machine Co., George, 1319 Racine St., Racine, Wis.

CAP SCREWS—Flat Head
Allen Mfg. Co., Hartford, Conn.

CAP SCREWS—Socket Head
Allen Mfg. Co., Hartford, Conn.

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CASTINGS—Nitri-Cast-Iron
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Tomkins-Johnson Co., The, 630 North Mechanic St., Jackson, Mich.
Universal Engineering Co., Frankenmuth, Mich.

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Danneman Company, F. C., 203 Lafayette St., New York, N. Y.

CLAMPS—Toggle
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Tomkins-Johnson Co., The, 630 North Mechanic St., Jackson, Mich.

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Danly Machine Specialties, Inc., 2100 So. 52nd Ave., Chicago, Ill.

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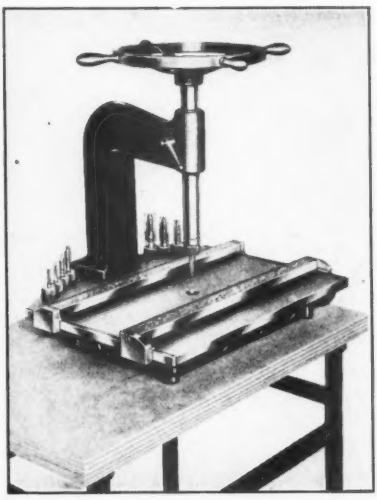

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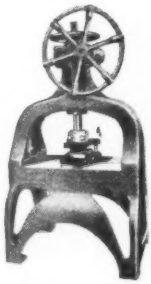

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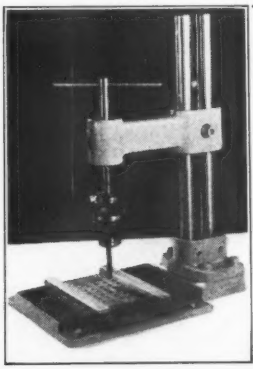

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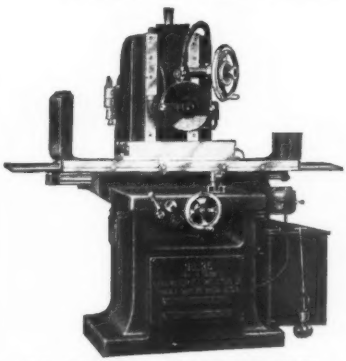

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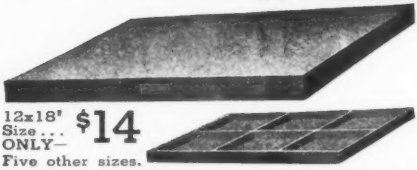

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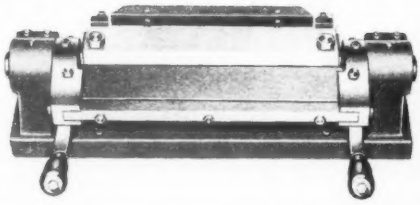

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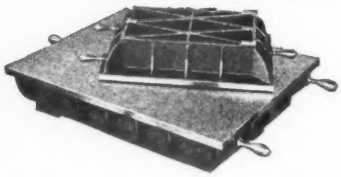

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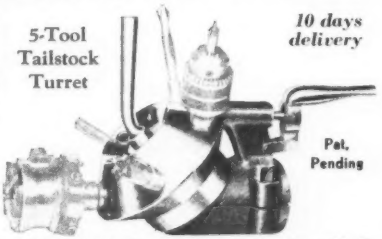

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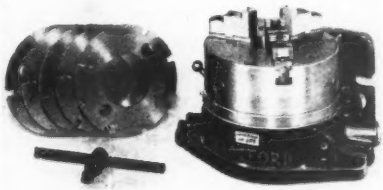

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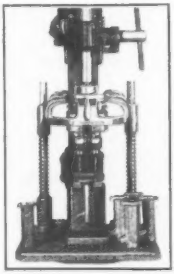

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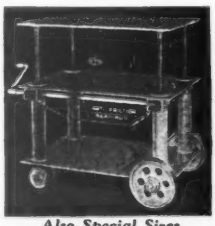

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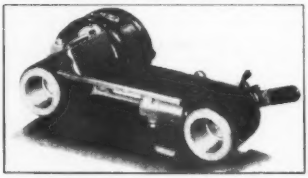

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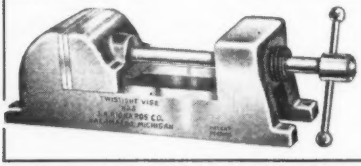

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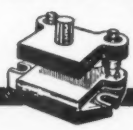

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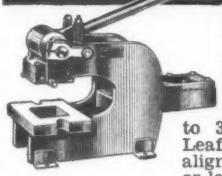

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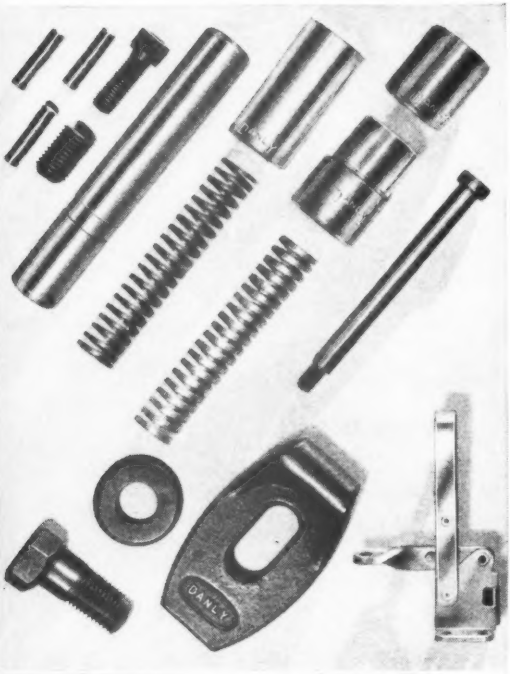

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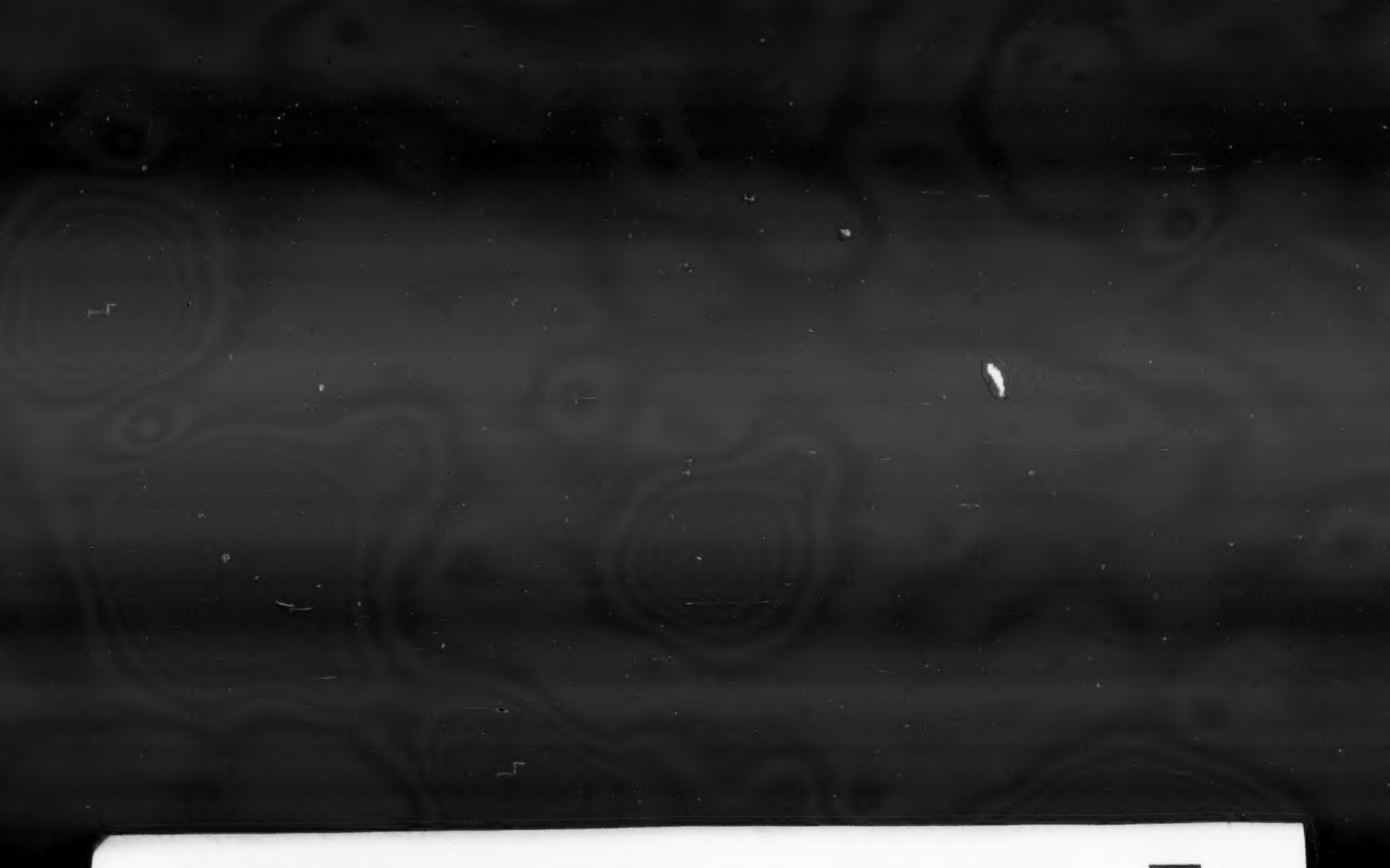
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